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THERAPEUTIC CONSIDERATIONS OF THROMBOPHLEBITIS AND PHLEBOTHROMBOSIS*

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AS emphasized in previous publications[1–4] from etiologic, prognostic and therapeutic standpoints, it is important in intravenous thrombosis to distinguish between two major types of intravascular clotting, that is, thrombophlebitis and phlebothrombosis. The clotting in thrombophlebitis is the result of injury to the vascular endothelium from mechanical trauma, bacterial invasion or chemical injury, whereas in phlebothrombosis the intravascular thrombus formation is due to venous stasis and to alterations in the cellular and fluid constituents of the blood that increase the clotting tendency. The prognostic significance of this differentiation lies in the fact that in thrombophlebitis the clot is usually firmly adherent to the vein wall and is therefore less likely to become detached and result in embolism. On the other hand, in phlebothrombosis the coagulum is loosely attached to the vessel and is therefore likely to cause embolism. The therapeutic significance of this differentiation lies in the recognition of the respective processes and the institution of appropriate measures to prevent the occurrence of complications and to enhance restitution.

In this presentation, no attempt is made to discuss etiology and pathogenesis because these have been reviewed in previous publications[1–4] and will be presented more extensively in subsequent reports.

PROPHYLACTIC MEASURES

Preoperative Procedures

Re-establishment of normal cardiovascular function. The possibility of intravenous clotting must be considered in any patient who has tissue injury as a result of operative, accidental or puerperal trauma, and invasion by infection or neoplastic disease. Whereas preventive measures cannot be considered in many of these conditions, much can be accomplished prophylactically in the surgical and puerperal cases. Because cardiovascular disease, with its resultant circulatory retardation, may be a precipitating factor, it is essential to re-establish the *normal cardiovascular function* as much as possible before any operative procedure. Welch,[5] in 1900, reported 4 cases of thrombosis or thrombophlebitis of the upper extremity and collected 23 from the literature. At that time, he regarded this as a rare complication of heart disease. Belt[6] obtained a history of cardiac impairment in 49 of 56 cases of pulmonary embolism. He is of the opinion that circulatory embarrassment is of primary importance in the etiology of venous thrombosis and pulmonary embolism. Cardiovascular disease was the predominant illness in half the nonsurgical cases of pulmonary embolism studied by Henderson.[7] Ophüls and Dobson[8] found cardiovascular disease in 52 per cent of their cases of thrombosis and embolism. Putnoky and Farkas[9] noted that approximately 90 per cent of 91 cases of pulmonary embolism had cardiovascular disease, and a large number of these showed fatty degeneration of the myocardium. Bauer[10] found that the patients in 95 of 100 cases of postoperative thrombosis and embolism had abnormal hearts. He is of the opinion that impairment of cardiac function is an important factor in the etiology of venous thrombosis. Oberndorfer[11] observed that of 97 fatal medical cases of pulmonary embolism, 64 patients had cardiovascular disease at the time of the terminal seizure. Rosenthal[12] reported 94 cases of thrombosis in 149 autopsies performed on patients with cardiac decompensation. Axhausen[13] reported 270 cases of venous thrombosis in 1472 autopsies on patients with heart disease. Storz[14] emphasizes that the incidence of thrombosis is dependent more on the condition of the heart and

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the circulatory system than it is on the disease process or the operation. Kuhn[15] found that in autopsy material, between the years 1919 and 1927, — during which there was a definite increase in vascular diseases, particularly arteriosclerosis, — there was a marked increase in thrombosis. Burke[16] reported that of a total of 648 cases of intravascular clotting, 444 were associated with cardiac disease. His statistics further emphasize the importance of cardiovascular disease in the development of thrombosis, because in this series there were 218 patients who developed thromboses after escaping it following a previous operation. Of this number, 179 had cardiovascular disease as a primary or an important secondary condition. Barker and his co-workers[17] found that of 1665 patients with thrombosis and embolism, 219 (13.1 per cent) had cardiac disease.

Of great significance from the standpoint of cardiovascular disturbance is advancing age. It is well known that in older persons, because of the decrease in cardiovascular activity, thromboses are likelier to occur. According to Ewald,[18] intravenous clotting occurs in young people only when there is a circulatory disturbance. Koch[19] found that between the ages of fifteen and nineteen years the circulation time averaged eighteen seconds; between thirty and forty years it was twenty-one seconds, and at seventy years it was twenty-three seconds. In patients in whom there was a circulatory disturbance, the circulation time was frequently as much as sixty-one seconds, and after operation there was a definite interference with the circulation. Numerous other observers have emphasized the effect of cardiovascular disease in the production of intravenous clotting and the necessity for treatment of cardiovascular dysfunction.[20–27] Blumgart and Weiss,[28] from clinical investigations concerning circulation time, found that in general the degree of cardiac decompensation is of importance. These clinical observations emphasize the significance of cardiovascular diseases in the production of intravenous thrombosis and indicate the necessity of their detection and correction preoperatively. The value of prophylaxis in this connection is exemplified by von Jaschke's[22] results. Whereas in a series of 2053 operations the incidences of thrombosis and fatal embolism were 1.75 and 0.6 per cent respectively, in a comparable series of 1362 operations in which the patients were systematically digitalized preoperatively, the corresponding incidences of thrombosis and fatal embolism were 0.9 and 0.5 per cent. Koenig[29] found that, following the use of Sympathol in 2000 cases postoperatively, the incidence of thrombosis and embolism decreased from 6.2 to 0.95 per cent. Similarly, Frauendorfer[30] observed a decrease from 10.6 to 2.3 per cent and in the mortality from 2.3 to 0 per cent. Similar observations have been made by others.[31, 32]

Because of the definite vasoconstrictor effect of *smoking*, it is essential preoperatively, particularly before an operation in which there is likely to be considerable trauma, that smoking be stopped for a period of days or weeks. As has been emphasized in previous publications, smoking produces distinct vasospasm and thus favors vascular retardation, which in turn is an important factor in the production of intravenous clotting. Subsequently, when the treatment of intravascular clotting by vasodilatation is discussed, the role of vasospasm in the production of the condition will be emphasized.

In *varicosities* of the lower extremity with associated venous stasis,[33] the possibility of thromboses in the dilated veins must be considered. Barker et al.[17] found that of 1665 cases of thrombosis and embolism, 203 had simple varicosities of the lower extremity. The importance of varicosities as a factor in thrombophlebitis has been repeatedly emphasized.[18, 21, 34–39] For this reason, varicosities must be corrected preoperatively either by curative measures or by palliative compression with bandages, which should be worn during the early postoperative period. By so compressing and obliterating the dilated, superficial venous system, stagnation of blood in the superficial system is obviated and the rate of blood flow in the deep venous system is increased, both of which tend to decrease retardation. In this way the possibility of thromboses both in the superficial and deep veins is diminished.

The value of compression of the superficial veins in thrombophlebitis was first stressed by Fischer.[40] A great deal can be accomplished prophylactically by the use of compression bandages even in patients who have no varicosities, because by compressing the superficial veins the rate of flow in the deep veins is increased. Numerous observers have directed attention to the prophylactic value of compression,[21, 26, 36, 37, 41–44] particularly in the presence of *predisposition* to thrombophlebitis or phlebothrombosis. Leun[36] states that for nine years he and his associates have been using compression bandages prophylactically in patients in whom they feared a thrombosis — these are patients who had varicosities, circulatory disturbances or other *predisposing factors*. In 280 cases, they applied five hundred elastic compression bandages. In 3 cases, the treatment was a failure in that a thrombosis occurred. In two of these, slight thrombosis occurred because the bandage was not applied tightly enough, and the third

patient died of a pulmonary embolism, but autopsy showed that the thrombus originated from a pelvic vein and not from a leg vein. Although Unna[45] and Lasker[46] have suggested the use of Unna's paste boot for its antiphlogistic action, most observers agree that the compression is the significant factor, and it is for this reason that an adhesive elastic bandage is usually preferred to a simple adhesive plaster.

As we[1–4] have previously stated, constitutional predisposition is a definite familial tendency.[47–58] These patients characteristically are fat, weak-muscled and pale skinned, and have a relatively low blood pressure, vagotonia and a psychic lability.

Reduction in weight. Numerous observers have directed attention to obesity as a predisposing factor in thrombosis.[18, 41, 42, 59, 60] Snell[60] found that of 150 obese patients who died postoperatively the cause of death was thromboembolism in 48 (31 per cent). Henderson,[7] in a statistical analysis of post-mortem thromboembolism cases, reported that the average weight of the patients was 13 pounds greater than normal. Barker and his co-workers[17] reported that obesity exerts a definite influence on the production of thrombosis and embolism. They observed that in patients who had an abdominal hysterectomy the incidence of postoperative venous thrombosis and pulmonary embolism was 4 per cent in patients who weighed less than 200 pounds and 8 per cent in those weighing more than 200 pounds. Of 3680 patients on whom intestinal operations were done, thromboembolism occurred in 3.2 per cent of those who weighed less than 200 pounds, and 7.1 per cent of those who weighed more than 200 pounds. Friedländer[41, 42] believes that in obese patients interference with the return flow of blood through the femoral veins is greater because the opening in the femoral canal is encroached upon by fat and because the fat bolster in the buttock is larger and thus results in greater elevation of the pelvis. This makes a higher angle in the femoral vein and thus further interferes with the flow of blood into the pelvis. According to Snell,[60] the increased incidence of thrombosis in obese persons is due to the greater difficulty in operating, to the greater likelihood of circulatory retardation and to the liberation of large quantities of lipoid thromboplastic substances. Rössle[61] is of the opinion that in obese persons, because of the increased weight of the leg, the pressure of the calf muscles against the bed is sufficient to compress the veins, and thus predisposes to intravascular clotting. These observations emphasize the importance of obesity in the production of thromboembolism and indicate the necessity of reduction in weight as a preoperative prophylactic measure.

Elimination of foci of infection. As emphasized in previous publications,[1–4] infections are contributory in the production of distant thromboses, because of the changes in the blood constituents resulting from destruction of tissue. For this reason, it is prophylactically desirable to remove all foci of infection whenever possible. Gougerot and Frumusan[62] reported a case of phlebitis studied bacteriologically and histologically in which an anaerobic streptococcus was found in an abscessed tooth, the intradermal reactions to this organism being strongly positive. Biopsy of the phlebitic vein showed the same organism. Of interest in this connection is the report of a case of migratory thrombophlebitis which was apparently due to a focus of infection in a tooth, since recovery followed its extraction.[63] The relative frequency of thrombophlebitis complicating typhoid fever has long been known. It has been recently emphasized by Conner,[64] who states that this incidence is as high as 10 per cent. It has also been recognized as a complication of Boutonneuse fever.[65] Barker and his co-workers[17] found that of 1665 cases of thromboembolism there were 379 (22.8 per cent) with severe infections. Other infections that are likely to be associated with thrombosis are influenza, acute rheumatic fever, syphilis and endocarditis. Bargen and Barker[66] have stressed the importance of thrombosis as a complication of chronic ulcerative colitis; they observed 18 cases with severe thromboses among 1500 cases of the disease.

Significance of cancer. The significance of malignant neoplasms as predisposing factors has also been emphasized. Trousseau[67] was one of the first to call attention to the causal relation of cancer and thrombosis and to note that frequently the first manifestation of an internal cancer is peripheral phlebitis. Sproul[68] noted the relatively high incidence of venous thrombosis as a complication of carcinomas of the body or the tail of the pancreas. In 56 per cent of cases of carcinoma of these portions of the pancreas, a single thrombus was present, whereas in 31 per cent the venous thrombosis was largely disseminated. Flörcken[21] and Schäfer[69] have also emphasized the effect of carcinoma as an etiologic factor. In patients with cancer, because of the tendency toward thrombosis, it is essential to use prophylactic measures. In the absence of specific preventive measures, compression of the extremities by means of elastic adhesive is of great value.

Hydration and mineralization. The replacement of fluid as a preoperative measure is imperative

because dehydration and increased viscosity of blood predispose to thrombosis. As emphasized by Gordon-Watson,[70] it is essential to replenish the fluids in those patients who have had purgation preoperatively and who have lost considerable fluid by hemorrhage, sweating or vomiting. Preoperative remineralization is of equal value. Kopf[71] is of the opinion that the highly purified sodium chloride employed at present is responsible for the high incidence of thrombosis. He believes that a great deal can be accomplished in the preparation of these patients by giving various salts beforehand, such as mineral water, Brunner's salts and Glauber's salts. Ross[72] found in experimental animals that following the administration of small amounts of calcium nitrate there was an increased tendency to thrombosis because of the alteration in the calcium-sodium ratio. Russo[73] attempted to determine whether there is a sodium chloride deficiency in thrombosis. He investigated 44 cases either at the time of or shortly after the occurrence of a venous thrombosis. Of these, 8 patients had thrombosis of both lower extremities; 10, pulmonary infarction; 21, marked cardiac insufficiency; and 2, postpartum thrombosis. The sodium chloride values of the blood serum in 10 cases fluctuated between 500 and 550 mg.; in 28, between 550 and 600 mg.; and in 6, between 600 and 620 mg. per 100 cc. On the basis of these results, Russo concludes that hypochloremia is not a factor in the production of thrombosis. These conclusions are supported by the contentions of Vogt,[26] who believes that a salt-free diet is of prophylactic value. On the other hand, Menninger-Lerchenthal[74] is of the opinion that a hypochloremia is a factor in thrombosis. He reports 5 cases of spontaneous thrombosis or thrombophlebitis in patients who received varying doses of sodium bromide and who were on a low-salt diet. He thinks that the administration of bromides results in displacement of the chloride radicle, which according to him and to Prima[75] exerts a detoxifying action. These authors are of the opinion that postoperative hypochloremia is a factor in the development of thrombosis. Prima has given 400 to 1000 cc. of physiologic saline solution to all patients postoperatively, and during a period of thirteen years has never seen any thrombosis. It is evident that hydration and remineralization are useful measures in the prevention of thromboembolism.

Correction of anemia and other dyscrasias. It is essential preoperatively to correct an existing anemia, because of the increased tendency to thrombosis in such a condition. Lockhart-Mummery[76] and Donald,[77] in 1924, directed attention to the greater likelihood of thrombosis in anemia. The latter reported 3 cases of profound anemia in which the patients developed fatal pulmonary embolisms, and believed that the thrombosis was to a large extent caused by the anemia. Others[78, 79] have also emphasized the increased incidence of thrombosis in patients with long-continued hemorrhage. Drinker, Drinker and Kreutzmann[80] demonstrated that following hemorrhage there is an increase in the cellular elements, which may increase the coagulability of the blood. These changes may be at least partly responsible for the increased incidence of intravenous clotting in cases of anemia secondary to hemorrhage. In addition to the increased coagulability of blood, anemia also predisposes to thrombosis because of its secondary effect on the cardiovascular system, resulting in diminution in cardiac tone, and circulatory retardation. Because anemia is an important predisposing factor in thromboembolism, careful blood studies must be made preoperatively in all cases, and deficiencies should be corrected by blood transfusions and other appropriate measures. Polycythemia is not infrequently complicated by intravascular clotting, particularly in the portal vein, probably because of the increased viscosity of the blood resulting from the increased number of erythrocytes. In such cases, it is desirable to employ venesection preoperatively.

Whereas intravenous clotting can occur in any patient, it is particularly likely to occur in the presence of the predisposing factors discussed above. Accordingly, it is essential that such factors be recognized preoperatively, that appropriate prophylactic measures may be instituted. Obviously, in some cases, the prophylactic measures that can be used are specific, such as correction of cardiovascular disturbances, whereas in others the preventive measures are necessarily nonspecific.

Operative Procedures

Atraumatic surgery. As emphasized previously,[1–4] and as mentioned above, the absorption into the vascular system of proteid disintegration products originating from injured tissue, as a result of operative, accidental or puerperal trauma, infection and invasion by cancer, increases the coagulability of the blood and predisposes to intravascular clotting. The role of accidental trauma is emphasized by McCartney's[81] statistics. In 73 cases of pulmonary embolism there were 15 which were strictly post-traumatic; in 12 of the latter the patients had fractures of the lower extremity, and in all, the patients were confined to bed. Potts[82] reported 95 cases with fractures of the lower extremity, in 5 of which the patients

developed thrombophlebitis; he is of the opinion that thrombophlebitis developed in these cases partly because the extremity was immobilized and the patient was unable to take exercises.

Whereas it is impossible to control the degree of accidental trauma and difficult, if at all possible, to control the injury to tissue by infection and neoplastic disease, a great deal can be accomplished operatively by employing atraumatic surgery. As has been repeatedly stressed, *sharp dissection* results in less trauma than blunt dissection. The *gentle handling of tissues* cannot be overemphasized. The clamping of vessels only and the avoidance of mass grasping of tissue are essential. The significance of operative trauma in the production of postoperative thrombosis has been emphasized by a number of clinical and experimental observations.[14, 29, 70, 76, 78, 83–89] Lambret and Driessens[90] found that following an operation there was a rise in the polypeptides, which reached its maximum about the fifth day, and that this was more prolonged the more traumatic and the more histolytic the operative procedure. Mason[91] and Takaura[92] have shown that tissue extracts are potent in the production of intravascular clotting, the former investigator having found that 0.003 gm. of lung-tissue extract will produce complete intravascular coagulation in a rabbit. Of equal importance is the *absolute hemostasis*, because the absorption of blood from a wound gives rise to proteid disintegration products. Because absorbable suture material produces an intense inflammatory reaction, which is necessary for proteolytic digestion of the suture, greater tissue injury occurs in wounds closed with such material, a condition that increases the absorption of split-protein products. If *fine nonabsorbable suture material* is used, this reaction of the wound is definitely decreased, as evidenced by the clinical appearance of the wound and by a much lower temperature curve. This is further supported by the histologic examination of experimentally produced wounds.[93] In our clinic, we have for the past two years used cotton suture material exclusively, because it was found experimentally that this material gave the least reaction of all those investigated.

Avoidance of contamination. It is imperative that the trauma during the operation be reduced to a minimum, and that contamination of the wound be prevented, not only because the infection itself is undesirable, but also because of its effect on intravascular clotting. The continuation of the infection with the destruction of tissue, causing the liberation of larger quantities of split proteins, favors thrombosis.

Hydration and mineralization. During the operative procedure, it is essential that excessive loss of fluid be prevented. Commonly, under a general anesthetic, there is considerable loss of fluid through perspiration and insensibly through the lungs. Because dehydration and loss of electrolytes predispose to thrombosis, fluids should be administered parenterally, either intravenously or subcutaneously, during the operation. The importance of the fluid loss during an operative procedure has repeatedly been emphasized by Coller and his associates.[94, 95]

Prevention of circulatory collapse. Patients who are submitted to extensive operative procedures with considerable trauma, particularly if there is much loss of blood, may develop a circulatory collapse. In such cases, it is imperative to prevent this collapse by the prophylactic administration of saline solution, blood or plasma. It may be necessary to resort to vasoconstrictor drugs, to prevent the prolongation of a hypotension, which would predispose to intravascular clotting. The prevention of circulatory collapse, owing to its effect on intravascular clotting, is of value because such collapse favors vascular retardation, anoxia and injury to the vascular endothelium and, if prolonged, increases the blood viscosity.[96]

Avoidance of chilling. Chilling during and after the operation should be prevented because of its vasoconstrictor effect, which predisposes to vascular retardation. Chilling is probably detrimental in another way, since it increases the viscosity of the blood, as shown by Barbour and Hamilton,[97] who demonstrated that exposure to cold causes a loss of fluid from the vascular channels into the tissues. This increases the viscosity and the clotting tendency, and is probably the effect of a combined sympaticoadrenal activity. The necessity of preventing chilling during the operative procedure has been emphasized by Leriche[98] and others,[99, 100] who employed infrared irradiation during the course of an operation. Birgus[101] suggested the use of flannel stockings during the operative procedure to prevent chilling. This is an extremely valuable suggestion, and stockings should be applied to the lower extremities during not only the operation but also the postoperative period.

Postoperative Procedures

Hydration and mineralization. After a patient has been returned to his bed following an operative procedure, it is imperative that the replacement of fluids and electrolytes be continued, because in the early postoperative period, particularly after laparotomy, the patient is unable to take fluids by mouth and frequently is losing considerable fluid from his stomach and intestine as

a result of vomiting or removal by means of an indwelling duodenal catheter. An increased viscosity of the blood may occur postoperatively, as demonstrated by Zarubin[102] and Bolognesi.[103] Similar observations were made by Löhr and Löhr,[104] who found that the viscosity parallels the erythrocytic sedimentation rate. In addition to the reasons mentioned above for the administration of fluids and electrolytes, it is essential that the water balance be re-established as quickly as possible, because in this way the elimination of waste products, among which are the split-protein substances that predispose to intravascular clotting, is effected.

Posture. The posture of the patient postoperatively is of great importance in predisposing to or preventing thrombosis. Because vascular retardation is a prominent precipitating factor in the production of intravascular clotting, postures that cause slowing of the blood stream should be avoided, and conversely, postures that favor the return flow of blood in the venous system should be used. The placing of a patient in a Fowler's position, with flexion of the thighs on the abdomen and flexion of the legs on the thighs at the knees, results in compression of the vessels in the popliteal space and should therefore be avoided. Whereas flexion of the thigh on the trunk theoretically produces compression of the femoroiliac veins beneath the inguinal ligament, Friedländer[42] has shown that such a position actually produces less compression, favors the return flow of blood, and tends to prevent vascular retardation. This may be accomplished either by elevating the foot of the bed from 30 to 45 cm. or, preferably, by elevation of the leg and foot and flexion of the thigh on the trunk at an angle of 45°. Friedländer showed that, if the thigh is extended and on a level with the trunk, the femoroiliac veins are kinked as they pass from the thigh through the inguinal canals down into the pelvis, and that the veins assume a straight direction if the thigh is flexed on the trunk at an angle of 45°. He also emphasizes the value of elevating the leg above the level of the thigh so that no kinking occurs in the popliteal space. Elevation of the foot of the bed to prevent vascular retardation, a procedure that we believe should be employed, has been repeatedly emphasized.[18, 22, 42, 101, 105–113] Frykholm[114, 115] and Patey[116] advocate elevation of the head of the bed as a prophylactic measure in intravascular clotting. Frykholm is of the opinion that if the lower extremities are elevated, the deep veins become emptied of their blood and the venous endothelium suffers, because lack of nutrition causes changes that favor thrombosis. On the other hand, if the patient is placed in a head-up position, these veins become filled, the vascular endothelium is better nourished, and there is less danger of change in the endothelium and resultant thrombosis. Patey believes that the contraction of the muscles necessary to keep the patient in this position favors the movement of blood, a factor that cannot be denied, and that if thrombosis does occur, it will take place in a vessel that is dilated and in which a greater inflammatory reaction and a more extensive clot will result, tending to fix the thrombus in the vessel. Whereas muscular contractions are necessary to keep the patient in the head-up position and are of undoubted benefit, it is our firm conviction that better results are obtained by elevation and mobilization of the extremities, which speed up the blood flow and prevent circulatory retardation.

Mobilization. The immobility of a patient postoperatively is undesirable for several reasons. As a result of the quiescence, cardiovascular activity is decreased, which tends to produce vascular retardation. Muscular inactivity predisposes to vascular stasis because the movement of blood in the vein is dependent to a great extent on the contraction of muscles. For these reasons, early postoperative mobilization is essential as a prophylactic measure in venous thrombosis. Ries,[117] Richardson,[118] Boldt[119] and others[120–125] were early advocates of movement of the legs while the patient is in bed. More recently, the significance of such exercise has been further emphasized.[1–4, 27, 78, 82, 105, 126–136] Although the bed bicycle of Gamble[137] and the elaborate mass gymnastic procedures recommended by Kirschner,[138] which consist in performing co-ordinated exercises twice daily wth music under the supervision of a gymnast, are probably unnecessary, movement of the muscles of the lower extremities, preferably against a resistance, should be used in all cases when possible. Potts[82] has emphasized that whereas thrombosis and embolism are common in patients with fractures who are confined to bed and in plaster encasements, they are rare in ambulatory patients with arm, leg, shoulder or spine fractures, in similar encasement. In each case, the amount of tissue trauma and the local immobility are the same, the only difference being the systemic immobility in the former and the systemic mobility in the latter. The value of local and systemic immobilization is further stressed by McCartney's[81] 73 cases of pulmonary embolism, of which 15 were strictly post-traumatic; 12 of these patients had lower-extremity fractures and were confined to bed. That exercises alone will not prevent intravascular clotting, however, is exemplified by a case of Conner's in which

rather extensive thrombosis occurred in a patient with typhoid fever who conscientiously used daily exercises of his arms and legs.

Early ambulation. Early ambulation of the patient postoperatively is favored in most Continental clinics. Not infrequently, a patient who has had an appendectomy performed through a muscle-splitting incision under local analgesia is permitted to walk back to his room. Campeanu[139] reported 1300 cases, many of which were severe, in which the patients were allowed to walk directly from the operating room to the ward and to take gymnastic exercises immediately afterward, including even jumping. Campeanu has extended early ambulation to such an enthusiastically ludicrous degree that he performed an appendectomy on one of his assistants, who immediately afterward assisted him in another operation, and also on another assistant, who immediately afterward performed an appendectomy. Patients who have had extensive operations, such as resection of the stomach, are allowed to sit on the edge of the bed on the afternoon of the operation, and to sit out of the bed the day following the operation. This ambulation is used for two reasons: to decrease the circulatory retardation, and to diminish the incidence of respiratory infection. Zava[140] quotes his experience with this therapy in more than 6000 operations without a single case of embolism, although many of the cases were gynecologic or other pelvic procedures. He gets his patients up either on the first or second day, and, if this is not possible, he keeps them in bed until the second week, because he quotes Forgue as stating that embolism is likeliest to occur between the third and thirteenth days. The value of early ambulation is emphasized by von Jaschke,[22] who found that among 300 cases in which patients were allowed to get up relatively late, there were 2 per cent thromboses and 1 per cent fatal emboli, whereas in 387 cases in which early ambulation was used, the incidence of thromboses was 0.5 per cent and there were no fatal emboli. In the Essinger University Clinic, there were, from 1906 to 1912, operations on 1504 cases, following which the patients got up at the end of the second week and in which the incidences of thrombosis and fatal embolism were 2.63 and 1.40 per cent, respectively. From 1912 to 1918, there were operations on 2053 cases, following which patients got out of bed between the second and fifth days and in which the corresponding incidences were 1.75 and 0.6 per cent. Smith[141] reports abdominal or pelvic operations following which the patients have got out of bed within a few days. There were four deaths in the group, one of which was due to embolism; none of the cases could be attributed to the early rising. Voegt[135] and von Jaschke[22] are other advocates of early ambulation. The advantage of getting the patient out of bed relatively early is exemplified by the investigations of Smith and Allen,[142] in which it was shown that postoperatively beginning on the fifth day the circulation time was increased and that on the tenth day it was approximately 50 per cent greater than the preoperative average. Eighty-two per cent of the individual cases showed increases of four or more seconds at some time after the operation. Similar observations were made by Sylvan.[32]

Respiratory stimulation. Normally, the negative pressure within the thorax favors the return of venous blood to the cardiac chambers. Because of the diminished respiratory activity that follows operation, there is an interference with the normal venous return. Moreover, hypopnea occurs postoperatively as a result of pain caused by movement of the abdominal muscles and an increase in abdominal tension. It has been shown repeatedly that postoperatively the diaphragmatic excursions are diminished, which results in concomitant diminution in the negative intrapleural pressure, venous stasis and circulatory retardation.[143–152] Prevention of hypopnea is therefore important, and patients should be instructed to take frequent deep breaths during their waking hours. It is the custom in our clinic to have the patient take at least ten deep breaths every hour. Whereas it is frequently necessary to insist on voluntary deep breathing, which is preferable, if this is not possible it may be necessary to employ carbon dioxide inhalations.[128, 137, 153] Because of the depressant effect of opiates on the respiratory center, it is desirable to use them as sparingly as possible, to minimize the danger of hypopnea. The value of deep breathing has been repeatedly emphasized.[18, 20, 78, 82, 93, 101, 105, 116, 122, 123, 131, 134, 135, 154, 155]

Abdominal tension. Increased intra-abdominal pressure also favors circulatory retardation by exerting pressure on the intra-abdominal veins, and thus interfering with the return flow of venous blood from the lower extremities. Increased intra-abdominal tension may result from a number of factors, such as application of constricting bandages, which are frequently used by surgeons in an attempt to give support to the abdominal wall, and functional inactivity of the gastrointestinal tract, with its associated accumulation of fluid and gas in the stomach and the intestine (ileus). For this reason, the increased intra-abdominal tension resulting from tight bandages or from ileus should

be combated by avoidance of tight dressings, by the use of appropriate devices, such as the indwelling catheter and the double tube, and by other methods previously described.[156] As shown by Patey[116, 151] and Frimann-Dahl,[147] there is a definite increased intra-abdominal tension postoperatively, apparently the result of a decreased action of the diaphragm and the splinting of the abdominal wall.

Compression bandages. In patients in whom an intravenous clotting is likely to occur the application of compression bandages to both lower extremities should be used postoperatively for the same reasons advocated for their preoperative use, given above.

Heat. The application of heat in the form of a heat tent to the lower part of the abdomen and the extremities is undoubtedly of value after an operation, not only because of its beneficial effect on the tone of the intestine, but also because it produces reflex vasodilatation of the peripheral vessels. The extremely low incidence of intravascular clotting in our clinic is owing, we believe, to the fact that large heat tents covering the abdomen and lower extremities are routinely used postoperatively. The application of heat is particularly important, because circulatory activity is further decreased by the peripheral vasoconstriction that has been shown to exist by Leriche[98] and Kvale,[157] and in previous investigations by us. Because of the vasoconstriction of the capillary bed, venous stasis occurs, which in turn predisposes to thrombosis. Smith and Allen[142] showed that postoperatively the circulation was definitely slowed and that this was more pronounced when the extremity was cold and less marked when it was hot, irrespective of the cause of vasodilatation. The use of woolen or flannel stockings postoperatively, to retain the body heat and prevent irradiation, cooling and vasoconstriction, is desirable.

Hirudinization and heparinization. The use of anticoagulants as prophylactic measures has become increasingly popular. Hirudinization and heparinization owe their efficacy to their anticoagulant activity. The former has been emphasized by one of us in collaboration with Mahorner,[158] and more recently by Chalier,[159] and Rouhier.[160] Murray and Best and their co-workers[161–163] in Canada, Crafoord[164, 165] in Sweden, and Priestley, Essex and Barker[166] in this country have used heparin prophylactically to prevent thromboembolic phenomena. These investigators found experimentally that by administering purified heparin intravenously over a period of hours it was possible to diminish the coagulation time considerably. Good results have been reported from its clinical use. Murray and Best[161–163] used heparin postoperatively in 315 cases, and in none did thromboembolism develop. Crafoord[164, 165] treated 126 cases prophylactically with heparin; one developed a pyrexia, which might have been due to thrombosis. In a control group of 809 cases, 122 patients (15 per cent) had evidence of thromboembolism, although in 64 of these the only manifestations of thrombosis were changes in temperature and pulse. Sodium citrate intravenously has been suggested by Kreiner[167] and others[126] as another prophylactic anticoagulant. Unless there is definite evidence of hereditary predisposition or unless the patient gives a history of having had previous thromboses, it is doubtful whether the routine use of any of these anticoagulants is justified prophylactically.

Therapeutic Measures

By the institution of the above prophylactic measures, most cases of intravascular clotting can be prevented, and this without doubt is a desideratum. Occasionally, in spite of the use of these procedures, intravascular clotting occurs. The prognosis and the therapy in each case are dependent on the type of the lesion and its location. Of great significance is the differentiation between intravascular clotting in the superficial and in the deep veins, and of even greater importance is the distinction between intravascular coagulation associated with an inflammatory lesion of the vein, that is, thrombophlebitis, and coagulation in which there is no associated inflammatory process, that is, phlebothrombosis. Generally, the prognosis is better, and the therapy more easily applied in cases with superficial thrombosis than in those with thrombosis of the deep veins.

Superficial Thrombosis

Thrombophlebitis. In cases of thrombophlebitis involving the superficial veins, the treatment is usually *conservative* and consists in compression of the entire extremity from the metatarsal phalangeal joints up to the groin. Adhesive elastic bandages should be applied to the thigh because of the difficulty of preventing the ordinary type of compression bandage from slipping owing to the conical shape of the thigh. To prevent propagation of a thrombus, it is imperative that these patients be treated by ambulation and not be allowed to remain in bed. The value of the compression and ambulation therapy was first emphasized by Fischer.[40] Compression of the extremity is efficacious by compressing the vein wall against the thrombus, tending to fix it, and by producing relative immobility of the vein.

Whereas thrombophlebitis in the superficial veins can usually be treated satisfactorily by compression and ambulation, *radical therapy* — high

ligation—is occasionally desirable. In the majority of superficial thrombophlebitides, radical therapy is unnecessary; however, because of the occasional detachment of a superficial thrombus resulting in massive embolism, this procedure becomes lifesaving. We have observed 4 cases at autopsy in which death resulted from a massive pulmonary embolism, the clot originating in the long saphenous vein. These fatalities could have been prevented by the timely ligation of the saphenous at its junction with the femoral vein. Homans[168] states that he has observed infarction but never fatal pulmonary embolism following thrombophlebitis of varicosities. We believe that in cases with long-saphenous-vein involvement in which the thrombophlebitic process has extended up to the lower part of the thigh, it is desirable to do a high ligation at its junction with the femoral vein and to follow this by compression and ambulation. Approximately forty-five years ago, Gluck[169] reported a case of postpuerperal thrombophlebitis of the long saphenous vein successfully treated by proximal ligation. In 1909, Müller[170] reported a similar case. Homans[168] advocates high ligation of the long saphenous vein when it is involved in a thrombophlebitic process. Hollingsworth[171] has recently reported a case in which this was done. Occasionally in varicosities, particularly those involving the leg at the site of a hugely dilated vein, localized thrombophlebitis occurs. This is extremely painful and may result in an ulceration, owing to interference with the blood supply. In such cases, local excision of the thrombophlebitic segment is desirable. When suppuration occurs in the thrombophlebitic segment, high ligation of the saphenous should be performed because of the possible propagation of the thrombus and detachment of infected emboli. Occasionally, excision of a localized thrombophlebitic segment of vein is desirable when an intraluminary suppuration occurs. Generally, however, because the suppurative process extends beyond the vein, in addition to high ligation of the main stem of the superficial vein, incision and drainage of the involved areas are necessary. Büdinger[172] advocated multiple incisions along the course of the involved veins in suppurative superficial thrombophlebitis. Eisenklamm,[173] a student of Büdinger, recently reported the results in 66 cases of nonsuppurative and suppurative superficial thrombophlebitis. Forty-two patients so treated were discharged from the hospital on the seventh or eighth day. In one of our cases, incision and drainage of a local suppurative thrombophlebitic process resulted in prompt cure. In another with propagation and evidence of sepsis, high ligation was necessary and was followed by recovery. In a third with a rapidly progressing suppurative thrombophlebitis and sepsis, as evidenced by positive blood cultures, high ligation and subsequent incisions and drainages were necessary to effect a cure.

Phlebothrombosis. Thrombophlebitis of the superficial veins can be readily recognized not only by the presence of the palpable clot in the vein but also by local manifestations of inflammatory reaction, namely, tenderness, redness and increased heat over the involved vein. On the other hand, intravascular clotting unassociated with an inflammatory reaction, phlebothrombosis, occurs with evidence of minimal inflammatory reaction, the principal manifestation being a palpable clot in the vein. As mentioned before, the danger of such a clot's becoming detached, and thus gaining entrance to the venous system and being carried to the pulmonary veins, is particularly great. It is for this reason that these patients should never be treated conservatively, but high ligation of the vein at its junction with the deep venous system should be done as early as possible, the extremity compressed by means of bandages, and the patient made ambulatory. This relatively simple procedure will not only shorten the patient's convalescence but will in many cases prevent tragic complications resulting from the detachment of the nonadherent clot.

Deep Thrombosis

Intravascular clotting of the deep veins produces a different clinical picture from that of the superficial veins, and here again one must distinguish between thrombophlebitis and phlebothrombosis.

Thrombophlebitis. In cases in which there is an inflammatory involvement of the vein with accompanying systemic manifestations of infection, such as fever and leukocytosis, there is generally a decrease in the surface temperature of the involved extremity, a paradoxical manifestation. This is in contrast to the thrombophlebitic lesions involving the superficial veins in which the skin overlying the vein is red and warm. It has been well known for years that the involved extremity of patients with deep thrombophlebitis, particularly in the femoroiliac veins, in addition to being swollen, is white and frequently has a cyanotic hue as well as a decrease in the surface temperature. The significance of this paradoxical manifestation, that is, coldness and pallor in the area of involvement in the presence of inflammation and pyrexia, was not appreciated by us until it became apparent by our animal and clinical investigations that, although the lesion was primarily in the large, deep veins, the manifestations were principally those of spasm of the arterial system, the decrease in tem-

perature and the whiteness of the extremity being due to ischemia.

The treatment of thrombophlebitis of the deep veins can be divided into two large categories, *conservative therapy* and radical therapy. In most cases, the former suffices. Elevation of the extremity should be carried on because it favors the return flow of blood and tends to decrease the propagation of the thrombus. Whereas immobilization previously has been considered an important form of therapy,[34, 87, 113, 126, 129, 131, 174-175] we are of the opinion that absolute immobilization is undesirable. Of great value in conservative therapy is the application of compression bandages to the extremity. The bandages should extend from the toes to the inguinal region. The rationale for their use has been discussed above, but briefly depends on an increased flow of blood in deep veins. Of equal significance is the beneficial effect they exert in preventing edema, and in retaining heat and increasing the vascularity of the extremity by virtue of the fact that they encase it. Müller[43] advocates the use of compression bandages and getting the patient up as soon as possible. He reports 85 cases of deep thromboses treated in this way. Many of the patients had massive swelling; some had pulmonary infarcts and had been in bed for weeks. Usually, after ten to fourteen days all symptoms had disappeared. In none of these cases did small lung infarcts develop, but there were two fatal pulmonary emboli, which the author believes cannot be blamed on the use of the compression bandage. In contrast, 40 cases of thrombophlebitis were treated by elevation only. In this group there were 6 cases (15 per cent) of fatal pulmonary embolism. There were 3 additional cases of pulmonary infarction. Müller states that compression treatment has decreased the incidence of fatal embolism from 15 to 2.3 per cent. He believes that compression reestablishes the competence of the venous valves and favors the attachment of the thrombus to the vein wall. He also thinks that by improving the circulation it prevents the propagation of a thrombus, which because of lack of attachment may be easily broken off and result in embolism. This is the most dangerous feature of thrombophlebitis. In his experience, the use of the compression bandage decreased the convalescent time from six to eight weeks to eight to twelve days. Fischer[40] has used this method of therapy in several thousand cases, and has never observed fatal embolism. Krammer[186] and Friedländer[41] treated a series of 196 cases by compression bandage, with only 1 case of fatal pulmonary embolism, which they thought was due to incorrect bandaging. On the other hand, in 308 cases treated by elevation there were 64 cases (16 per cent) with fatal emboli.

Bahls[187] states that since 1923 in the Kappis Clinic they have used compression bandages in cases of thrombosis and thrombophlebitis. Of 181 cases of thrombosis, they have lost 6 patients from emboli. Three of these would have died anyway. He states that if the bandage is applied at the earliest manifestation of thrombosis, fatal pulmonary embolism does not occur. In cases of thrombophlebitis, he advocates the application of adhesive bandage and ambulation. Lepler[23] treated 45 cases of postoperative thrombosis by means of adhesive plaster compression, and of this number 35 patients had no complications, 9 developed infarcts, and 1 died of pulmonary embolism. There were 36 cases with progressive thrombosis and thrombophlebitis treated in this way, in none of which complications occurred. In 17 cases of pulmonary infarction with no evidence of thrombosis, adhesive compression of the extremities was used prophylactically; of these, 3 patients developed fatal pulmonary emboli. Lepler[23] emphasizes that in the cases treated by adhesive compression in which ambulation was possible neither infarction nor fatal embolism developed, whereas infarction occurred in 9 and fatal pulmonary embolism in 4 patients who were bedridden in his series.

Cabernard[188] states that he used compression therapy in thrombosis and thrombophlebitis for five or six years in more than 100 cases and never observed infarcts or emboli. Whereas, previously, patients with thrombophlebitis had been kept in bed for six weeks, in this group they remained in bed only four or five days. Of about 40 cases with fever, 1 patient remained in bed for three weeks, 1 for fourteen days, and 2 for ten days. In the last 3 patients, the thrombophlebitis extended above the inguinal ligament. The other patients stayed in bed only two or three days. When the condition of the patient permitted, ambulation was begun on the day the bandage was applied. Numerous other observers are warm advocates of the use of compression bandages.[18, 21, 26, 27, 36, 37, 113, 189–193]

The application of heat postoperatively is of advantage in thrombophlebitis of the deep veins, as well as that in superficial veins. This has been adequately discussed above. Similarly, the use of anticoagulants, such as hirudin and heparin, may be of value in isolated cases. Termier,[194] in 1922, is credited with the revival of treatment of thrombophlebitis by leeches. He reported 73 cases in which this form of therapy was used with remarkable relief of acute manifestations. Subse-

quently, numerous others, especially in Europe, reported similar observations following this method of therapy.[21, 22, 35, 38, 188, 189, 195–228] Hirudin, which is secreted by the leech's salivary gland, can completely prevent coagulation, and in vitro has been observed to cause dissolution of a blood clot. It was on this basis that Termier[194] explained the good results obtained by the use of leeches. Other explanations are based on the production of an increase in phagocytic and bactericidal powers,[229] local blood letting,[225] prevention of venous spasm[205] and general hirudinization.[230] The action of hirudin was experimentally investigated in the Tulane Surgical Laboratory, and leeches were used clinically.[158, 231] There was a rapid subsidence of symptoms following this procedure. At present, its greatest value lies in the treatment of such conditions as portal thrombophlebitis (pylephlebitis). Some observers[160, 232, 233] have warned against the use of hirudin on the basis that it might produce a liquefaction of the clot, with resulting embolism; this has never occurred in our experience.

Although the use of heparin is of no value, so far as the clot that is already formed is concerned, it is of value in preventing the propagation of a thrombus by decreasing the coagulability of the blood. Murray and Best[161, 162] heparinized 7 patients with pulmonary embolism and infarcts, with recovery in all. Of 28 cases of thrombophlebitis treated with heparin, none developed emboli. Crafoord,[164, 165] on the other hand, did not obtain such favorable results in a similarly small series. Of 20 cases with thromboembolic manifestations, there were only 5 in which the results were good. More recently, Murray[234, 235] reported 81 cases of phlebitis in which heparinization was used. The results in this group were very good, and no patient had pulmonary embolism. He is at a loss to explain satisfactorily these beneficial effects; he states: "The only effect that heparin could have is to prevent extension of thrombosis. It is possible, therefore, that the healing of the lesion already present is allowed to take place and that with prevention of extension of the process the active inflammation recedes and the symptoms disappear with it." The heparin is administered by continuous intravenous injection, and the dosage is regulated so that the clotting time of the blood is maintained at between fifteen and twenty minutes. The patient is kept in bed on the average of one week, and after the acute manifestations have subsided, — by the third or fourth day, — active exercises in bed are encouraged. At the end of this time, he is allowed out of bed, and if no untoward manifestations develop the administration of heparin is discontinued. Murray and Best state that most of their patients were discharged from six to fourteen days after treatment was instituted.

Graves,[236] in 1906, reported 2 cases of thrombophlebitis of varicosities that were successfully treated with irradiation. More recently, Henschen and Becker[237] advocated roentgen irradiation in thrombophlebitis. They state that from four to twelve irradiations effect a disappearance of the phlebitic symptoms. They advise the use of between 100 and 200 r, applied over the involved extremity, and emphasize that the severer the inflammation the weaker the irradiation should be. They also state that the dose should be decreased or increased according to the location, the type of infection, the age and the general condition of the patient. They believe that the beneficial results are due to the increase in the bactericidal action of the blood stimulation of the reticuloendothelial system and to the formation of antibodies. They state that the convalescence is definitely shortened. Birgus[101] reports the use of roentgen irradiation in 49 cases of thrombosis, 23 of which were deep, 20 superficial and 6 mixed. The extremity was irradiated over several fields, the dosage varying from 100 to 200 r per field. In superficial processes, one treatment was usually enough. In the acute processes, the treatment was begun with small doses. Birgus states that the duration of the process is shortened by roentgen-ray treatment, the pain and swelling disappear more rapidly, and the pulse and temperature soon return to normal. Halban[238] and Kilbourne[190] advocate using deep x-ray therapy in chronic thrombophlebitis. The latter author emphasizes that roentgen-ray therapy should not be used until the thrombophlebitic process has become chronic.

In previous experimental and clinical investigations, we[1–4] have shown that vasoconstriction of the arterioles and venules plays an important role in producing a persistence of clinical manifestations. The use of vasodilatory measures in the treatment of thrombophlebitis has recently received considerable attention. Murphy[239] and, more recently, Sokolov and Meyers[240] have advocated iontophoresis with acetyl-beta-methyl-choline hydrochloride (Mecholyl). Murphy reported favorable results with his form of therapy in 33 cases of thrombophlebitis. Nineteen patients with thrombophlebitis of the deep veins were treated by this method by Sokolov and Meyers, and improvement was observed in 18. However, only 3 were in the acute stages, although the authors stated that the best improvement was obtained in cases of acute involvement. Vasodilatation by

means of artificially induced fever has been suggested by Weymeersch and Snoeck[241] and by Pitfield.[242, 243] The former authors used injections of sterile milk to produce the fever, and the latter employed injections of typhoid vaccine. Paine and Levitt[244] have recently reported the use of intermittent venous occlusion in the treatment of thrombophlebitis. This method of therapy was employed in 4 cases of acute thrombophlebitis, and in 7 of the chronic form, with relief of pain, tenderness and discomfort. Edema was decreased in some cases but unaffected in others.

In our experience, the best method of therapy in thrombophlebitis of the deep veins is the production of vasodilatation by blocking the regional sympathetic ganglion with procaine hydrochloride, as suggested by Leriche.[245, 246] In 1934, Leriche and Kunlin[247] reported 3 cases of acute postoperative phlebitis successfully treated by this method, and subsequently they[248] reported other cases in which similar results were obtained. Since then, numerous other reports[249–260] have appeared, which attest to the success of this method of therapy.

We[1–4] have shown by experimental and clinical observations that vasospasm resulting from impulses originating in involved venous segments is one of the most important factors in the production of the clinical manifestations of thrombophlebitis. These investigations indicate that the vasospastic influences affect both arterioles and venules. In animal experiments,[261, 262] the volume pulsation in the hind feet of dogs was determined plethysmographically by the sensitive method of Turner. The femoral veins of the dogs were exposed from just proximal to the saphenous entrance below to Poupart's ligament above, and ligatures were placed at these two sites. A chemical thrombophlebitis was produced in the ligated venous segment by injecting a 40 per cent aqueous solution of sodium salicylate. The perivascular tissues in the entire venous segment were then carefully infiltrated with procaine hydrochloride solution, and plethysmographic determinations were made following each of these procedures. In another group of animals, a similar experiment was performed, except that a resection of the corresponding lumbar sympathetic ganglia and intervening chain had been performed twenty-four hours previously. It was invariably found that the volume of pulsation in the foot was markedly decreased following ligation of the femoral vein, and that it almost disappeared following the production of the chemical thrombophlebitis. This effect was always abolished by the interruption of nerve pathways by local infiltration with procaine hydrochloride at the site of the chemical irritation or by resection of the lumbar sympathetic ganglia and the intervening chain. These experiments demonstrate that the decrease in volume pulsation following chemical thrombophlebitis and periphlebitis is due to vasoconstrictor impulses initiated locally by the chemical irritant and coursing through the sympathetic ganglia to reach the terminal arterial vessels of the extremities. We have also been able to demonstrate clinically that a definite vasospasm exists in thrombophlebitis and that this vasospastic action can be abolished by novocain block of the regional sympathetics. Numerous other clinicians have shown that a localized thrombophlebitic process can initiate a marked vasospasm.[263–284] Indeed, the vasospasm may be so great that the condition appears to be arterial embolism,[257, 264, 266, 271–278, 280–283, 285–290] and in some cases actual gangrene has occurred.[285, 287, 289, 291–294]

In previous publications, we[1–4] have discussed in detail the mechanism by which vasospasm and thrombophlebitis can produce clinical manifestations. Edema may be due to factors that result from vasospasm and increase the amount of perivascular fluid: increased filtration pressure, anoxia of the capillary endothelium and diminution in the flow of lymph. The increase in venous pressure in thrombophlebitis has been repeatedly demonstrated. This obviously increases the filtration pressure, which favors transudation of fluid from the vascular into the perivascular spaces. Because of the associated arteriolar spasm and evidence of diminished vascularity, there probably occurs an anoxia of the capillary endothelium that increases its permeability, permitting an excessive exudation of fluid into the perivascular spaces and thus resulting in the production of edema. Once the fluid gets out of vascular channels in such a case, it has difficulty in getting back because of the increase in the pressure on the venous side. Probably of greater significance in this condition is the fact that the pump, which is responsible for the movement of lymph, is lost. Several investigators[295, 296] have demonstrated that the movement of lymph is dependent on arteriolar pulsations. In the presence of marked vasospasm and increased venous pressure,[261, 262] arteriolar pulsations are reduced to a minimum, and the lymphatic pump is thereby lost. This decrease in lymph flow results in the stagnation of the lymph fluid and the accumulation of proteins in the perivascular fluids, thus setting up a vicious circle, in that the pressure of the perivascular fluid approaches that of the intravascular fluid, tending to prevent absorption of fluid from the perivascular spaces into vascular channels. Such a vicious circle is broken by novocain block of the sympathetic ganglia, which

causes an interruption of the vasoconstricting impulses and thus produces a re-establishment of the normal exchange of the intravascular and perivascular fluids. It has been demonstrated that blocking of the sympathetic nerves increases the flow of lymph.[297, 298] As a result of vasodilatation, the blood supply to the capillaries is increased, anoxia of the capillary endothelium is relieved, and excessive exudation of the vascular fluid into the perivascular spaces is prevented. By the return of the normal arteriolar pulsations, the pump, which is responsible for the movement of lymph, is re-established, and the perivascular fluid is rapidly carried away. Because of this, the edema of the extremity in a patient with phlegmasia alba dolens disappears within a relatively short time after the production of sympathetic-ganglion block. Similarly, the other manifestations associated with thrombophlebitis are relieved, probably by the increased vascularity. Pain, which is one of the most prominent manifestations of thrombophlebitis, is relieved dramatically. Prompt subsidence of fever may also be explained on the basis of a more rapid resolution of the inflammatory process by the increase of vascularity to the involved venous segment.

The results of vasodilatation obtained by novocain block have been reported in previous publications.[1-4] Up to the present, 71 patients have been treated by this method, with prompt relief of symptoms in all. Pain was completely and permanently relieved within fifteen minutes to half an hour after the first injection in 64 cases (90 per cent). Seven patients (10 per cent) required a second injection before the pain was permanently relieved. In 46 cases (65 per cent), the patients were fever free within forty-eight hours after the institution of therapy; in 17 (24 per cent), the temperature returned to normal within three to five days, and in 5 (7 per cent) from six to eight days. There were only 3 cases (4 per cent) in which the pyrexia lasted longer than eight days. Two of these patients had pyrexia resulting from pulmonary infarcts, one lasting twenty-one days and one thirty days, and both recovered completely. One patient had persistence of fever for ten days because of puerperal sepsis. The subsidence of edema was usually rapid. The edema completely subsided within four days or less in 40 cases (56 per cent), in from five to eight days in 23 (32 per cent), in nine to ten days in 6 (8 per cent), and in eleven to twelve days in 2 (3 per cent). Forty-four patients (62 per cent) were discharged from the hospital as cured within four to eight days after the institution of treatment. Twelve (19 per cent) left the hospital from the ninth to the twelfth day after the institution of therapy, and 7 (10 per cent) remained in the hospital more than twelve days. All remained in the hospital longer than twelve days because of conditions other than the thrombophlebitis. The follow-up observations made on a number of these patients for periods varying from several months to over three years are particularly significant. In none has there been any evidence of recurrence of edema or of other postphlebitic manifestations. This is a particularly important fact in view of the large number of cases that developed postphlebitic edema following other forms of therapy and of the lifelong disabilities consequent to these postphlebitic manifestations.

The technic of lumbar sympathetic block has been described in detail previously,[2, 3, 299, 300] but in brief is as follows:

The patient is placed in the lateral recumbent position. The sites of puncture in the skin are determined by taking points approximately two and a half fingerbreadths lateral to and on a horizontal level with the spinous processes of the first four lumbar vertebrae. Twenty-gauge or 21-gauge lumbar-puncture needles approximately 9 cm. in length are employed. Each needle is inserted vertically until the transverse process of the vertebra is reached. The direction of the needle is then changed slightly to permit deeper insertion either above or below the transverse process, and the needle is inserted approximately two and a half fingerbreadths beyond the transverse process so that its point is near the anterolateral surface of the body of the vertebra where the sympathetic chain lies. Five cubic centimeters of 1 per cent procaine hydrochloride solution is injected through each needle, care being taken to determine previously that the needle is not in a vessel. It has been found that daily blocks should be performed until the temperature returns to normal and remains there. Generally, two or three blocks are sufficient.

Usually, thrombophlebitis can best be treated by conservative measures, and one need not fear the detachment of thrombi with the production of emboli, because as a result of the inflammatory reaction in the vein wall, the thrombus is firmly attached. Conservative measures are sufficient to bring about relief of symptoms and a rapid resolution of the process. Rarely, *radical intervention* is necessary. The indications for radical therapy are suppuration at the site of the thrombophlebitic process, with resultant liquefaction of the clot and the production of infected emboli. Also, in some cases of thrombophlebitis in which the infection extends proximally along the vein wall through

the perivenous lymphatics, a rapid progression of the thrombophlebitic process or a propagation of the clot occurs. In either event, division and ligation of the vessel proximal to the diseased process is imperative to prevent the extension of the process upward and possible fatal embolism and sepsis. A typical example of this is the postpuerperal sepsis in which a thrombophlebitic process involves the venous channels draining the uterus. In such cases, rapid progression of the process, together with the breaking off of infected emboli, is likely to result in a blood-stream infection and fatality. Hunter,[301] in 1784, was apparently the first to apply measures to combat this possibility. He states: "If the inflammation has gone so far as to make the surgeon suspect that suppuration has taken place, then the compress must be put upon that part of the vein just above the suppuration. This I once practiced, and, as I supposed, with success." Lee,[302] in 1865, ligated a vein above the thrombophlebitic process in 2 patients suffering from this condition. In 1880, Zaufal[303] successfully ligated the internal jugular vein in the treatment of pyemia originating in the internal ear. Viereck,[304] in 1901, showed statistically the value of vein ligation in such cases. In a collected series of 108 cases, 89 patients recovered. Apparently Freund,[305] in 1898, was one of the earliest surgeons to apply the method in gynecology. He performed ligation and excision of the thrombosed ovarian vein and broad ligament in 2 cases; these procedures were unsuccessful. Several years later, Bumm[306–309] and Trendelenburg[310] performed venous ligation in puerperal pyemia, the former advocating ligation by the transperitoneal route and the latter by the extraperitoneal route. Ligation or excision of the pelvic veins in the treatment of suppurative thrombophlebitis of puerperal origin has been advocated by Bumm,[306–309] Trendelenburg,[310] Sippel,[311] and numerous others.[312–317] Proximal ligation, with or without excision, has been suggested by numerous others.[271, 318–328] Miller,[329] in 1917, collected 197 cases of puerperal pyemia treated by venous ligation; 15 were approached extraperitoneally, and 182 transperitoneally. The gross mortality was 51.6 per cent. In 1921, Martens[330] reported 11 gynecologic cases of thrombophlebitis in which ligation of the ovarian vein, as well as that of the internal or common iliac vein, was done. In 2 cases, the vena cava was successfully ligated. Recovery followed in 7 of the 11 cases. In puerperal infections, there is considerable controversy concerning the mode of attacking vessels. Whereas gynecologists have largely preferred the transperitoneal approach, surgeons have generally preferred the extraperitoneal approach. Martens[330] advocates the latter, and Krotoski[331] is of the opinion that the extraperitoneal approach should always be done because laparotomy produces more shock and is dangerous to these patients, who are already very ill. Moreover, there is danger that peritonitis will occur, because the ligation is not always possible in an uninvolved portion of the vein. In cases of thrombophlebitis involving the pelvic veins, it may be necessary to ligate both the internal iliac and ovarian veins. Krotoski[331] suggests that in an extremely ill patient it is best to ligate the internal iliac and the ovarian vein on one side through an extraperitoneal approach, but if the patient continues to have evidence of pyemia, as reflected by persistence of chills and fever, the vessels on the contralateral side should also be ligated. Otherwise, all four vessels should be ligated at the original operation. Ligation of these vessels is frequently lifesaving. If the thrombophlebitic process has extended up from the internal iliac into the common iliac vein and even into the vena cava, it may be necessary to ligate the vena cava above the thrombosed area. Krotoski states that ligation of the inferior vena cava for thrombosis has been performed in 48 cases, without any severe manifestations.

There is considerable controversy concerning the optimum time of operation. Although it is difficult to lay down definite rules, there is certainly a happy medium between the suggestion of Trendelenburg that these patients be operated on immediately after the first chill and the opinion of those who maintain that the operation should not be done until the disease has become chronic. Bondy,[332] Schottmüller[333] and Beuttner[334] advocate ligation of the vein after three chills and the demonstration of anaerobic streptococci in the blood culture. Whereas according to this suggestion the indications seem quite definite, we are in accord with Krotoski[331] that the clinical picture and sound surgical judgment are essential. A patient who looks ill, who has recurrent chills, and who apparently is losing ground should be operated on early; otherwise, a fatality is likely to occur. As early as 1912, Huggins[335] advised exploratory laparotomy in every suspicious case when the diagnosis is in doubt because, in his opinion, the "danger from thrombophlebitis is far more threatening than the risk of operation," if done early. If infarction has occurred, operation should be performed immediately, and procrastination in such cases is likely to mean disaster. The absence of chills in no way precludes the possibility of a septic thrombophlebitis. Krotoski reports that chills occur in only about half the cases. Schollenberg[336] states that, on the basis of the material

in the Zurich University women's clinic, in the cases in which a second chill was taken as an indication for operation, 67.4 per cent of patients were operated on unnecessarily, and in cases in which a third chill was taken as an indication for operation, 56.2 per cent were operated on unnecessarily. The importance of absence of chills has also been emphasized by Miller.[314, 329]

The technic of the operative procedure and the method of approach vary according to individual operators. A distinct advantage of the transperitoneal technic is that it is possible to visualize and ligate all four of the uterine vessels through a single incision. The operation does carry a higher risk, however, because of the greater shock associated with the transperitoneal approach, and also because of the potential danger that infection of the peritoneum will occur from division of an infected vessel. It is imperative that the vessel be isolated above the point of involvement, and not only that the vessel be divided but also that a segment of vein be removed. The former is of significance, because only in this way can the propagation upward and the liberation of the emboli be prevented. The latter is necessary to obviate the extension of micro-organisms through the perivenous lymphatics, which could continue if the vein is ligated only and is not divided. It is extremely desirable not only to divide the vein but also to extirpate a portion of it, since in this way the perivenous lymphatic extension can be more effectively stopped. Krotoski[331] emphasizes the value of careful examination of the urinary tract, because in this way it is possible to determine not only kidney involvement, but also the location of the lesion. In a case, which he reported, with involvement of the right side, there was extensive infection of the ureter and almost complete blockage on that side because of the associated inflammatory process extending from the ovarian vein. This would be a valuable procedure in determining which side should be operated on in the extraperitoneal approach. At the time of operation, it may be desirable to drain the area of the involved vein, as has been emphasized by Krotoski. In one of our cases with suppurative thrombophlebitis of the right ovarian vein, transperitoneal exposure and resection of a portion of the vein resulted in cessation of pyemic manifestations and subsidence of fever.

Kraussold,[337] in 1878, successfully ligated the femoral vein in a patient who developed a suppurative thrombophlebitis following a thigh amputation. In a previously reported case,[3] ligation of the femoral vein, because of a suppurative thrombophlebitis in the popliteal vein, was followed by immediate disappearance of septic manifestations. Griess,[338] in 1913, successfully performed thrombectomy and excision of a segment of the femoral vein in a case of postpuerperal septic thrombophlebitis. Rost,[339] in 1916, reported 2 cases of leg amputation followed by thrombophlebitis in which ligation of the femoral vein was successful. Numerous others[315, 340, 341] subsequently reported successful proximal venous ligation in femoral thrombophlebitis and emphasized its therapeutic and prophylactic value. More recently, cases of femoral thrombophlebitis successfully operated on were reported by Pool and McGowan,[323] and Van Duyn and Van Duyn.[342]

Proximal ligation has also been employed for thrombophlebitis of the mesenteric veins, and one of the earliest cases was reported in 1907 by Brunner,[343] although Gerster[344] had previously reported 2 successful cases in which exposure and evacuation of the thrombosed vein had been done. Wilms[345] advocated ligation of the veins in the ileocecal angle in cases of pylephlebitis and was successful in treating a case in this manner. Braun[346] advised ligation of the ileocolic vein in such cases, and performed this procedure successfully in 2 patients. Melchior[347] was able to collect from the literature 13 cases in which the Braun procedure had been used. In 8 cases in which it was employed at the time of appendectomy, all the patients recovered. In the 5 cases in which a secondary operation was necessary, there were 4 deaths.

Phlebothrombosis. In contradistinction to thrombophlebitis of the deep venous system, phlebothrombosis of these vessels occurs more insidiously and is frequently unassociated with marked clinical manifestations. Instead of a pyrexia, with pain in the extremity and an associated swelling and edema of the extremity, patients with phlebothrombosis have relatively little pain, usually little or no fever and generally no swelling. Of greater diagnostic importance is the increasing pulse rate—the "stepladder pulse" first emphasized by Mahler.[348] When pain is complained of, it is usually in the calf or in the sole of the foot, because, as Neumann[349] has shown, the thromboses are generally limited to the veins of the calf or foot. He found that the foot veins were involved in 71 per cent, the leg veins in 87 per cent, and the thigh veins in 22 per cent. Solitary thrombi occurred in the calf veins more frequently than in other veins. Solitary calf-vein thrombosis occurred in 29 per cent, solitary plantar-vein thrombosis in 12 per cent, and both calf-vein and leg-vein thrombosis in 57 per cent. Rössle[61] in postmortem studies found that 25 per cent of all cases had calf-vein thromboses. Of greater importance than spontaneous pain is that elicited by pressure

on the plantar aspect of the foot, on the medial aspect of the foot just beneath the medial malleolus or in the calf, or by forced dorsiflexion of the foot in the popliteal region, the so-called "dorsiflexion sign of Homans." On the basis of extensive anatomic studies, Bragard[350] found that examination of the lower end of the femoral vein was best performed by having the patient sit with his legs separated and externally rotated. This causes the hamstring muscles to be rolled to the inner side, bringing the femoral vein into a more superficial position. The examiner sitting in front of the patient can palpate with both hands the two femoral veins in their lower portions and can determine better whether there is tenderness and induration. For examination of the calf veins, he advocated grasping the muscles of the calf behind the tibia and eliciting tenderness by firm pressure. Whereas these patients do not appear to be so ill as those with thrombophlebitis, the possibility of serious trouble is much greater; because of the lack of the inflammatory reaction in the vein wall, the thrombus is either only loosely or not at all attached to the vein wall, and the chance of its becoming detached, with resultant infarction or massive embolism, is considerable.

As in phlebothrombosis of the superficial veins, *conservative therapy* is indicated in the absence of rapid progression and evidence of infarction. The application of elastic bandages to the involved extremity, extending from the metatarsal phalangeal joints up to the groin, is desirable. The thigh should be flexed and elevated to an angle of 45°, and the leg and foot should be elevated above the level of the knee. Passive and slightly active motion of the foot at the ankle is encouraged. After twenty-four to forty-eight hours, the motion can be made against resistance. This favors the movement of the blood in the deep veins. The application of a heat tent over the lower extremities is of great value, not only because of the support it offers to the bedclothes, but also because of the vasodilatating effect of the heat.

Hirudinization and heparinization have been employed and may be of value in these cases of deep-vein phlebothrombosis. Whereas heparinization has been advocated prophylactically and therapeutically, it seems to us that its value depends on the prevention of propagation of thrombi and the production of emboli. For such purposes, it appears that proximal ligation is a much safer and more reliable procedure.

Vasodilatation, by means of vasodilatory drugs such as papaverine, anaphoresis with Mecholyl or the use of sympathetic block is of value in cases of phlebothrombosis as well as in those of thrombophlebitis. The results obtained are not so dramatic as those in thrombophlebitis because such patients do not have the marked pain, swelling and fever that patients have with thrombophlebitis.

Whereas the manifestations in phlebothrombosis of the deep veins may subside completely under conservative therapy, because the thrombus is loosely attached, it is frequently necessary to resort to *radical therapy*. This is indicated in those cases in which there is rapid progression of the thrombotic process, as evidenced by upward extension of tenderness, a persistent elevation of pulse rate, and fever. The development of an infarct is an extremely important indication for radical therapy. Zink[351] states that in 70 per cent of cases with fatal pulmonary embolism there was a hemorrhagic infarct, indicating a previous embolism. Bahls[187] emphasizes the importance of restlessness, together with an elevation of the pulse, in a patient who is otherwise doing well. The patient senses that something is wrong. Bahls believes that these are premonitory manifestations of a fatal pulmonary embolus. Other indications for radical therapy, as emphasized by Homans,[168] are the failure of the subsidence of symptoms under conservative therapy and the return of manifestations after the patient is allowed up and after the symptoms have originally subsided. Sears[326, 327] believes that all patients with thrombosis of the calf veins should have proximal-vein ligation as soon as the diagnosis is made. Thrombectomy has been advocated by Läwen[273] and Kulenkampff,[352] the former extracting the thrombus through an opening in the femoral vein, the latter through the saphenous opening. Both attempt to save the deep venous system by suture of the vein wall. Lange[353] also advocates thrombectomy, but Fründ[354] states that ligation should also be done. Leriche and Geisendorf[355] performed thrombectomy but also resected a segment of the femoral vein. Whereas, theoretically, thrombectomy and suture of the vein seem desirable and although the experimental work of Hintze and Zollenkopf[356] appears to support the contention that these veins again function, we believe not only that it is unnecessary to attempt to save the vein but that it is actually dangerous. In one of our cases with extensive phlebothrombosis of the deep venous system and pulmonary infarction, the common iliac vein was ligated at its junction with the vena cava, and a concomitant resection of the third and fourth sympathetic ganglia performed. The patient recovered rapidly and has remained free of all previous manifestations. Homans[168] suggests saving the vein and heparinizing the patient. In one of his cases in which this was done, embolism recurred, thus making it necessary to divide the common iliac vein, following which embolism ceased and the leg became functionally useful. This case, it seems

to us, illustrates the danger of not ligating the vein, and the absence of any untoward symptoms following the ligation of the common iliac vein further demonstrates the innocuousness of such a procedure. Faxon[357] questions the advisability of attempting to save the vein. Unger[358] employed the same technic as Kulenkampff,[352] and reports 35 cases in which the saphenous vein was isolated and divided; 19 of the cases were not included because they were early cases, and the femoral vein was not cleaned out. In 8 other cases, no disease of the saphenous was found.

Whereas ligation alone or in conjunction with thrombectomy, or thrombectomy alone, is usually sufficient in radical therapy of phlebothrombosis, excision of an involved segment of vein is occasionally desirable. As emphasized by Leriche[245, 246, 355, 359] and Homans,[168] the removal of the thrombotic segment in which vasospastic impulses can originate is of value.

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THE MANAGEMENT OF GONORRHEA*

VI. The Sulfonamides

Neisserian Medical Society of Massachusetts

Sulfanilamide

SULFANILAMIDE should not be used in the treatment of gonococcal infections. Early reports of its high efficiency were commonly in error because of failure to evaluate cure by cultural methods. The immediate clinical response was good in a large number of cases, but subsequent clinical relapse was common, and cultural studies made by many later observers disclosed that innumerable asymptomatic carriers were being produced. These carriers remain potential spreaders of infection for many months.

Sulfapyridine

Sulfapyridine cures a much higher proportion of cases, but it causes more serious reactions than sulfanilamide does. Since a newer drug, sulfathiazole, is equally effective and causes few immediate reactions, this should be, at present, the drug of choice.

Sulfathiazole

There is much excellent evidence, based on careful and extensive cultural study, that sulfathiazole cures as high a proportion of gonococcal infections, in either sex, as any other sulfonamide now available. Of the failures, some do not respond at all, and the remainder either relapse or become asymptomatic carriers for variable periods.

Although many excellent treatment schemes have been and are still used, the following dose has the advantage of being simple and rapidly effective: 2 gm. daily for ten days; the daily dosage is usually divided into four doses of 0.5 gm. every four hours. The dose for children is 30 mg. per pound of body weight, but the total daily dose should not exceed 2 gm. The fluid intake should not be restricted.

In men, if there has been no clinical improvement by the fifth day, the drug should be discontinued for the time being, for its continued use will accomplish no favorable result. The clinical picture in women is so often confused by other conditions, however, that it is the rule to give the full course in every case and to depend on bacteriologic study for proof of response.

Infections that fail to respond to one course of sulfathiazole may often be cured by a second course, similar to the first, following a rest period of a week or ten days. More than two consecutive courses of the drug, however, are of questionable value.

In definite drug failures, careful search should be made for the possible cause of failure, and recourse should be had to local treatment. In some cases, fever therapy may be indicated.

The patient should be kept under observation during the course of sulfathiazole therapy because reactions may occur as a result of the administration of any of the sulfonamides. If there is persistent vomiting, rash or other severe reaction, the drug should be discontinued. Moderate nausea will be reported by an occasional patient, but is not ordinarily a cause for stopping the drug. There is no need for determining blood levels when the recommended dose is used, for concentration of the drug in the blood seems to have no relation to the clinical or bacteriologic result. Blood counts and hemoglobin determinations may be indicated for some patients.

Determination of Cure

When treatment has been concluded, the patient should be directed to abstain from unprotected sexual contacts for at least three months. Relapse should ordinarily occur within this period, if it is to occur. If cultural facilities are available, cultures of prostatic secretion and urine sediments in men and of exudates from the cervix and the paraurethral (Skene's) glands in women should be made from four to six times during this period. Smears, also, should be examined, but negative smears should not be relied on as evidence of cure. More than 3 to 5 pus cells per oil-immersion field in prostatic secretions are significant of prostatic infection of some kind (not necessarily gonococcal), but freedom of prostatic secretion from pus is not evidence of cure of a gonococcal infection.

In some women who have gonorrhea, the vaginal discharge continues or reappears after treatment

*In 1934, the Neisserian Medical Society of Massachusetts undertook the publication, in the *New England Journal of Medicine*, of a series of papers on the management of gonorrhea.[1-5] Shortly after the appearance of the fifth paper, in 1937, the sulfonamides were added to the therapeutic armamentarium. Until now, the Society has not been satisfied that enough data were available concerning the performance of these new drugs to permit sound conclusions about their worth. This sixth paper in the interrupted series is now presented as an expression of the Society's opinion concerning the place that the better of the sulfonamides should have in the therapy of gonococcal infection.

Since the American Neisserian Medical Society was about to issue a somewhat similar statement based on its wider experience, the two statements were combined, and will appear in essentially identical language. That of the American Neisserian Medical Society will appear in the *Transactions* for 1941.

has been stopped. It is worth while to search for other causes in these cases before concluding that the gonococcal infection has not been cured, or that the patient has been reinfected.

Some Valuable Advantages to be Gained

It is of the greatest advantage to begin treatment of infections in women immediately, without waiting for laboratory confirmation of the diagnosis, if the history of exposure or a known infection in the sexual partner, in addition to clinical evidence in the patient, points to gonococcal infection. Prompt treatment usually prevents extension of the infection into the pelvic cavity, or controls it if it has already occurred. The risk of permitting an infection to spread upward is much greater than the risk of using the drug in a case that may not be a gonococcal infection. Smears and, if possible, cultures, should be made at the first visit in every case, however, since they may help to establish the diagnosis. Once treatment is begun, they are likely to be negative.

Since sulfathiazole seems to cure a high proportion of gonococcal infections in both sexes, the prompt use of this drug should result in an early "chemical quarantine" of many of the infections. Every effort should be made, however, to keep the patient under sexual control for at least three months after apparent cure.

There is reason to be optimistic over the eventual control of gonorrhea, for it should now be possible to cure the disease much faster than it can spread. The medical profession has at hand a medium through which, if properly used, one more dangerous and prevalent communicable disease may be added to those that were once serious public-health problems.

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CLINICAL NOTE

THE CONTROL OF POSTOPERATIVE TONSILLAR HEMORRHAGE*

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BLEEDING following tonsillectomy usually occurs either within twelve hours following operation or between the fourth and sixth postoperative days. When it occurs during the latter period, it is usually the result of a slough due to imperfect healing. The bleeding is apt to be of the slow capillary type but is inclined to be persistent, and it is often difficult to find any distinct vessel from which it is coming.

Since general surgical principles have been applied and ligatures liberally used at the time of operation, the incidence of hemorrhage has been greatly reduced, but the condition still occurs frequently enough to keep the surgeon constantly on the alert, and anything that will make this troublesome problem easier should be welcomed.

Many methods, both mechanical and chemical, have been used in the past, but none has seemed quite ideal. The following procedure for controlling such hemorrhages was developed entirely by accident.

In the summer of 1920, I performed a tonsillectomy on an 18-year-old girl. Five days later, I was called to her home on account of bleeding from the throat. Examination showed that it was coming from the left tonsil wound, from what appeared to be a piece of tonsillar tissue.

Novocain was injected around the supposed piece of tonsil so that it could be removed, because it is well known that the removal of such tabs will sometimes stop bleeding. Immediately after the injection, the bleeding ceased. Further examination showed the supposed tonsillar tab to be only an organized clot.

This experience was impressive, and it led to the adoption of the same method in every case of delayed hemorrhage that I have treated within the last twenty years, a total of 126 cases.

Bleeding was promptly and permanently checked in every case except one. The patient in this case was a forty-three-year-old woman with a systolic blood pressure of 260. Hemorrhage occurred six hours after operation. It was necessary to place a ligature around the bleeding point.

The first step in this method is to gain the cooperation of the patient; this is time well spent. Next, the clot that is always present at the site of bleeding is swept out with a piece of gauze on a curved hemostat. The bleeding point is found if possible, and 1 or 2 cc. of a 1 per cent novocain solution containing 0.06 cc. (1 minim) of 1:1000 adrenalin solution per cubic centimeter is injected *superficially* around it. If the bleeding point cannot be found, the solution is injected at various places in the wound until bleeding stops.

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Ten cubic centimeters can safely be used. A syringe, similar in type to the small one commonly used by dentists, holding a 5-cc. ampule of sterilized solution, is used. The same syringe is used for tonsillectomies under local anesthesia. This method can be employed with a minimum of discomfort to the patient, and can easily be applied without anesthesia in quite young children.

The control of the bleeding is effected by the mechanical pressure produced by the solution, together with the vasoconstrictor action of the adrenalin.

The danger of infecting the deep tissues of the neck when injecting through a septic field has always been kept in mind, but no infection has occurred. In only a few cases have I painted the area to be injected with an antiseptic solution.

This method has been recommended to several associates, and all who are using it report uniformly good results. Its chief value lies in its simplicity and effectiveness. I am now using it to control bleeding at the time of the removal of tonsils, and also for spontaneous nasal hemorrhages.

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MEDICAL PROGRESS

ARTIFICIAL FEEDING OF INFANTS*

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THE present method of artificial infant feeding has become as simplified as the earlier percentage methods were complicated. Yet, in spite of this advantage, one is frequently surprised at some of the types of feeding that are encountered both in private practice and in public clinics. A consideration of the nutritional needs of the normal infant, the method of determining the formula, the expected vitamin requirements and the age periods at which food substances other than milk are added to the diet is therefore presented.

In determining the nutritional requirements of a normal infant, one must consider not only the structural requirements — that is, protein, fat, carbohydrate minerals and water — but also the energy requirements for basal metabolism, exercise, growth and repair, and loss through stools (a total of approximately 40 calories per pound).

The protein requirements of the normal infant are satisfied by a daily minimum of 1.5 gm. per pound of body weight, although on rare occasions it may be preferable to increase this amount to 2 gm. Cow's milk conveniently contains this amount of protein in 1½ ounces of milk, so that it becomes quite simple to multiply the weight of the infant by one and a half and thus derive the number of ounces of cow's milk required to meet the protein needs of the baby. This minimum requirement of cow's-milk protein is somewhat greater than that of human-milk protein, since cow's milk is relatively deficient in certain amino acids.

Although fat and carbohydrate furnish a certain amount of the structural requirements, they are primarily employed as available sources of energy. The percentages of fat (3.5 to 4.0) present in both mother's and cow's milk are approximately the same, and in the healthy infant can usually be tolerated without difficulty. In fact, when an infant is artificially fed, the percentage of fat in the formula is less than 3.5 to 4.0, owing to the dilution of the whole milk by the addition of water. Carbohydrate, which in the artificially fed infant should afford approximately one third the total number of calories, may be in any clean and inexpensive form such as cane sugar, Karo corn syrup and Dextri-Maltose. Although the sugar present in human milk is lactose, and although many are of the opinion that lactose is unquestionably the sugar of choice for these infants, it has been more than difficult to demonstrate any appreciable difference between infants receiving this sugar and those receiving a less expensive form, such as corn syrup.

The total fluid requirement for the normal infant varies, according to the age and weight of the baby. In the early months of life, and particularly during the first few days of life, this need can be satisfied by 2½ to 3 ounces per pound of body weight daily. As one might expect, this requirement is subject to change, such as in hot weather and in the presence of diarrhea, when large amounts of fluid are being lost. The mineral and salt content of cow's milk, although much greater than that of mother's milk, is usually tolerated very well by the infant and, except in the presence of pathologic conditions, adequately supplies the need.

When one considers the vitamin content of milk, exclusive of irradiated milk or milk ob-

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tained from a herd receiving irradiated yeast, vitamins A and B are usually adequate, but C and D are present in such small amounts that for practical purposes they must be considered inadequate. The average daily requirements of these substances can be met by the addition to the diet of 1½ ounces of orange juice or 3 ounces of tomato juice (25 mg. or 500 international units of vitamin C) and 2 teaspoonfuls of cod-liver oil (400 international units of vitamin D). Table 1 presents the more commonly employed sources of these vitamins.

TABLE 1. *Commonly Employed Sources of Vitamins.*

SUBSTANCE	VITAMIN A	B_1	C	D
	int. units	*int. units*	*mg.*	*int. units*
Human milk (quart)	2000	200	50	100–200
Cow's milk, pasteurized (quart)	2000	150	0–4	20
Cow's milk, evaporated (quart)	4000	300	None	40
Orange juice (ounce)	40	20	10–15	None
Cod-liver oil, *U.S.P.* (2 teaspoonfuls)	4800	None	None	680
Oleum percomorphum (5 drops)	6500	None	None	925
Viosterol (5 drops)	None	None	None	1000
Halibut-liver oil (10 drops)	8500	None	None	145
Halibut-liver oil with viosterol (5 drops)	4250	None	None	850
Brewer's yeast (10 grams)	None	126*	None	None

*Also vitamin G (B_2), 160 Sherman units.

Since the energy requirements of a normal infant have already been mentioned, a second table (Table 2) presents the caloric values of the various substances that constitute the diet of the young infant.

TABLE 2. *Average Energy Values and Measures of Food Substances in the Infant's Formula.*

FOOD SUBSTANCE	ENERGY VALUE	MEASURE
	cal./oz.	*tablespoonfuls/oz.*
Mother's milk	20	2
Cow's milk (4 per cent fat)	20	2
Home-skimmed milk	13	2
Fat-free milk	10	2
Cane sugar and Karo corn syrup	120	2
Lactose	120	3
Dextri-Maltose	120	4
Starch and uncooked cereal	100	3
Cod-liver oil	270	2
Orange juice	15	2

Attention should also be directed to the method employed in determining the actual amounts of milk, carbohydrate and water that constitute the formula. The daily caloric need is first obtained by multiplying the weight of the baby by a standard number of calories. In general, 45 to 50 calories per pound are adequate during the first months of life, whereas 40 to 45 calories are essential during the second half of the first year. As previously stated, the protein requirements are usually satisfied by 1½ ounces of cow's milk per pound of body weight, so that if one assumes that the baby weighs 8 pounds, one would need 12 ounces of cow's milk. This would not only contain the needed protein and minerals but would also furnish 240 of the necessary 360 calories, leaving the balance of 120 to be supplied by added carbohydrate. (It is advisable that approximately two thirds of the total caloric requirement be supplied by the milk and only one third by carbohydrate.) The total fluid volume is obtained by adding a quantity of water so that the resulting amount is approximately 2½ ounces per pound of body weight. To obtain this, one would add about 7 ounces of water, and the formula would then be:

Whole milk		12 oz.	(240 calories)
Carbohydrate		1 oz.	(120 calories)
Water	q. s. ad	20 oz.	(0 calories)
		20 oz.	(360 calories)

As the infant gains in weight, it becomes necessary to alter the formula to meet the increased demands. For example, when the baby reaches 12 pounds the formula would be:

Whole milk		18 oz.	(360 calories)
Carbohydrate		1½ oz.	(180 calories)
Water	q. s. ad	30 oz.	(0 calories)
		30 oz.	(540 calories)

The formula is prepared in the following manner:

Dissolve the specified amount of carbohydrate in the water, and add the solution to the milk. Boil this mixture over direct heat for three minutes, stirring constantly. When the mixture has cooled, pour it into a sterile graduate, preferably glass, or some measuring container, and add to this a sufficient quantity of sterile water to make the final volume. Divide the formula into the desired number of feedings by pouring the necessary amount into sterile bottles, which are then capped with sterile rubber stoppers. As soon as the bottles have cooled, they may be placed in the ice chest until needed. The number of feedings, or bottles, given to the baby each day depends not only on the age and weight but also somewhat on the infant itself, for it is certainly true that some babies gain and do well on a small number of daily feedings. However, the baby usually requires one feeding every four hours during the first few weeks of life, after which five daily feedings are ample.

Formulas prepared from evaporated or dried milk have found a useful position in infant feeding, and certainly there are occasions, as well as circumstances, when they can be employed to advantage. The chief objection to the use of these proprietary forms of milk is that it frequently becomes necessary to alter the protein or especially the fat content of the infant's formula (such as in the presence of an infection), and if such forms of milk are being employed this alteration

becomes practically impossible. Another objection is that there are no legal standards for the grade of milk used in these preparations. It is a common impression that evaporated milk produced by a given manufacturer is always the same, but this is not necessarily true: if the company is producing its product in several sections of the country, the grade of the milk varies according to the grade of the milk of the locality. In spite of these differences, experience has shown that evaporated milk may be employed as a satisfactory source of food for infants. When using it in preparing a formula, one has only to remember that half the water has been removed from the milk in its preparation, and that when this is replaced each ounce of the mixture is equivalent to an ounce of cow's milk. For example, if evaporated milk were used in the previous formula, the amounts would be: evaporated milk, 9 ounces; carbohydrate, 1½ ounces; and water, sufficient to make 30 ounces.

This simple mathematical determination of an infant's food requirements would make infant feeding a simple procedure if the resulting equation could be applied to all babies. Unfortunately, however, this cannot be done, since the requirements for each baby vary over a wide range, depending on the infant's ability to utilize the food, his activity and so forth. For example, one baby may gain and do well on 35 calories per pound, whereas another baby of the same age may require 50 calories per pound. Since it is impossible to know this beforehand, and since babies on a high-calorie intake are apter to develop digestive disturbances than those on a low-calorie intake, it is always safer, and therefore advisable, to start an unknown infant on a low-calorie intake and then to increase the diet should it prove inadequate. Again, an undernourished infant usually needs a larger amount of food per pound of body weight than a relatively normal baby, and as a rule the requirements more nearly approximate those based on the expected weight rather than those based on the actual weight.

Failure of a baby to gain on a well-balanced formula does not necessarily imply that the formula per se is at fault, and it certainly should not be considered an indication to change to something else — as it too frequently is. Any change in the formula should not be undertaken until after a thorough physical examination of the baby has been made and all evidence of infection — acute, chronic, enteral or parenteral — has been excluded. The formula is rarely guilty.

In those cases in which the infant has been breast-fed, if even for only a few days, little difficulty will be encountered when a formula feeding is substituted for a breast feeding. If necessary, one can replace one breast feeding by one formula feeding each day until the baby is weaned. On occasion, the mother may be unable to nurse her baby, and it becomes necessary to feed the infant artificially from the very beginning. In such cases, it is advisable to prepare a weaker formula, that is, one that contains less than 20 calories per ounce, since the digestive system of the newborn infant may not be able to tolerate a stronger mixture. An adequate formula for this purpose is one containing equal parts of milk and water and less carbohydrate than usual: for example, whole milk, 10 ounces; carbohydrate, ½ ounce; and water, sufficient to make 20 ounces. This formula may be offered two or three times on the second day of life, four times on the third day, and every four hours thereafter. Once this type of feeding has been satisfactorily established, the strength of the formula may be gradually increased until each ounce contains 20 calories.

I have already mentioned the addition of vitamins to the dietary and now need to consider only the periods at which other foodstuffs may be introduced. Although there may be rare cases in which it is necessary to add other foods to the diet, most infants do not require these substances before the fifth month of life. At this time, cereal may be added at the 10-a.m. and 6-p.m. feedings, being served with some of the formula poured over it. As soon as this is accepted by the baby, a small amount of stewed fruit, usually in the form of applesauce, may be included at 6 p.m. Strained vegetables, egg yolk and beef juice are frequently given by the sixth or seventh month. With the addition of these foods, one should gradually reduce the added carbohydrate in the formula, since these calories are available through the additional food. Experience has shown that it is not advisable to remove all the sugar at once but to reduce it every few days until it has been entirely removed. By such a process, one is often able to omit the formula and have the baby on three daily feedings by the ninth or tenth month of life.

I have deliberately omitted the quantities of each food substance that the baby should take. The baby is a very good judge himself, and if one only begins with reasonably small amounts and increases them as the baby shows his inclination and desire for more, one will go far in having not only a happy baby but also a happy mother. To say that the baby *must* take one tablespoonful of one substance and two of another at a specified feeding is as absurd as insisting that each baby must have a quart of milk a day. Insistence on such impractical principles as these usually results in an unhappy and stubborn infant who soon rebels against all his food.

319 Longwood Avenue

CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

CASE 27321*

PRESENTATION OF CASE

An eight-and-a-half-year-old girl was brought to the Outpatient Department with a complaint of vomiting. Her past history was not remarkable except for an appendectomy five years previously, and occasional attacks of abdominal pain and vomiting since that time. A mild upper respiratory infection had been present for the previous week.

While on a trip with her family two days before admission, the child had a strawberry milk shake and fried clams; other members of the family had the same type of food at that time. About half an hour later, she began to complain of low abdominal pain, and she vomited once. That night, she vomited three times but did not appear to be very sick. On the following morning, the mother gave her an enema, with a moderate fecal return. This was followed with another shortly thereafter, without results. During that morning, she ate nothing and vomited three times. The family physician was consulted, and advised an additional enema, which was unproductive, and a mild laxative, which was immediately vomited. The child had no fever, and played normally the rest of the day. On the day of admission, the abdominal pain seemed very much diminished, but she vomited several times. She passed no feces or gas by rectum. The family physician was called again that morning. After a flat plate of the abdomen was taken, which showed dilated loops of bowel, he advised that the child enter the hospital.

Examination revealed general dehydration, with sunken eyes, slight cyanosis of the lips and rapid, shallow respirations. The abdomen was distended and tympanitic, with moderately active peristalsis. There was no spasm or tenderness by abdominal or rectal palpation.

The temperature was 102°F., the pulse 120, and the white-cell count 15,000.

Within a few minutes after admission, a marked change in the patient's condition became apparent. The pulse became imperceptible, and cyanosis became more marked. Twice, she vomited large amounts of thin, brownish fluid material, which on later examination proved to be guaiac positive. There was no fecal odor to this material. During the next few minutes, her extremities became cold and pulseless, her breathing became more rapid and shallow, and she became disorientated. Restlessness became more marked, and the patient became comatose. Respiration and heart beat stopped apparently at the same time. There was no response to the intracardiac administration of adrenalin. Artificial respiration was attempted without success. Exitus occurred approximately twenty minutes after arrival at the Outpatient Department.

*This case is presented through the courtesy of the Children's Hospital, Boston.

DIFFERENTIAL DIAGNOSIS

DR. ROBERT R. LINTON: There are certain things in the past history of this patient that are of interest and bear a definite relation to the outcome. The fact that she had an appendectomy five years before admission should be noted, and also the fact that she had abdominal pain and vomiting on occasions after the appendectomy. I do not believe her mild upper respiratory infection had anything to do with her exitus. Nor do I believe the strawberry milk shake and fried clams eaten prior to the onset of the terminal illness had any bearing on her condition, since she vomited within half an hour after taking them. It is possible that the taking of food, and I think it could have been any kind of food, might have precipitated her trouble. The most important thing to me is the fact that she had complete obstruction shortly after the onset of her illness. She had a number of enemas which were unproductive. She had a mild laxative, which was vomited, so that we do not know whether it would have produced results or not — probably not. Her local doctor showed wisdom in having a flat abdominal x-ray plate taken; this is a useful diagnostic procedure in abdominal conditions, especially when one may be dealing with intestinal obstruction. It is reported that the plate showed dilated loops of bowel. I am sorry we cannot see that plate to determine whether the dilated loops were small bowel or large bowel, since such a differentiation is of considerable importance in making a decision of what the trouble is.

The patient was admitted to the hospital, and according to the physical examination, she was extremely sick. The cyanosis of her lips, I think, is a very important point. Her temperature was 102°F., and she had a pulse of 120. The abdomen on examination showed distention, which would go with the x-ray report of dilated intestinal

loops. I am a little surprised that she had moderately active peristalsis. I should almost think she was too sick for active peristalsis to have been present. At least, peristalsis rules out the possibility that she had peritonitis, since active peristalsis in the presence of peritonitis does not occur. She had no spasm or tenderness by abdominal or rectal examination. That also helps one in ruling out peritonitis, although I have seen cases of generalized peritonitis in which there was no spasm and practically no tenderness. The white-cell count was 15,000, which is consistent with either peritonitis or intestinal obstruction.

The extraordinary thing about this patient is that she died so shortly after admission to the hospital. Because she was vomiting large amounts of fluid, one wonders a little whether she died from suffocation following the aspiration of vomitus, but the story we have is not of this nature. The history describes the vomitus as thin, brownish fluid, a description which is typical — except for the fact that there is no mention of a fecal odor — of intestinal obstruction and probably small-bowel obstruction. It is possible that she was in such dire straits from dehydration and electrolyte loss that she could succumb as quickly as this. I have seen such deaths occur. I remember seeing a man in the Emergency Ward who was admitted in a condition very similar to that of this patient; he succumbed while being sent from the Emergency Ward to the operating room, so that people can die quickly of intestinal obstruction. The fact that the brownish fluid was guaiac positive is further evidence of intestinal obstruction. Such fluids are usually guaiac positive, owing to small capillary hemorrhages and stasis within the vascular system of the bowel.

My belief is that this patient died of acute intestinal obstruction, which resulted from the fact that a loop of ileum had become adherent to the appendectomy scar in the right lower quadrant.

A PHYSICIAN: Could she have had a pancreatitis?

DR. LINTON: I have never seen pancreatitis in such a young person.

DR. MILTON J. QUINN: Could she have had a condition associated with a Meckel's diverticulum?

DR. LINTON: If she had had, the diverticulum might have perforated, thus causing a peritonitis. It is possible, of course, to have intestinal obstruction or intussusception from a Meckel's diverticulum. I suppose I am assuming a little too much in thinking that the surgeon who operated on her five years previously ruled that out. It is possible that he did not, and there might have been a Meckel's diverticulum. It is a distinct possibility and should have been included in the differential diagnosis.

CLINICAL DIAGNOSIS

Intestinal obstruction, acute.

DR. LINTON'S DIAGNOSIS

Intestinal obstruction due to postoperative adhesions.

ANATOMICAL DIAGNOSES

Intestinal obstruction, acute, complete.
Volvulus of terminal ileum.
Old adhesions between ileum and abdominal wall at site of old appendectomy incision.
Pulmonary edema, severe, acute.
Bacteremia (unidentified, anaerobic, spore-bearing, gram-positive bacillus), agonal.

PATHOLOGICAL DISCUSSION

DR. SIDNEY FARBER:* Dr. Linton's first suggestion was the finding that we made at post-mortem examination. A volvulus of the small intestine passed around old adhesions, which connected the ileum to the abdominal wall at the site of the old appendectomy incision. The small bowel above the point of obstruction was very much distended. The walls of the small bowel were edematous. In its lumen, there was found about 500 cc. of rather thin dirty fluid, which had a fecal odor. On microscopic examination, the discolored portion of ileum was not necrotic in all places: there were areas where the mucosa was intact. The impression given by gross and microscopic examination was that the obstruction had been an intermittent affair.

The spleen was about half the normal size. Throughout the body, there was evidence of rather widespread vascular collapse. The veins all through the abdominal cavity were greatly distended with blood. The lungs were the site of marked edema.

The brain was approximately of normal weight and showed externally only moderate edema. On section after the brain was fixed, however, there were a number of small areas of destruction scattered throughout the brain, giving a Swiss-cheese appearance. These areas could be correlated with the presence in the lung on culture and in various organs in the body on section of gram-positive, spore-bearing bacilli, which looked like *Clostridium welchii* but which did not behave like this organism on guinea-pig protection studies. The organisms must have reached the blood stream just before death. There was no cellular reaction to these bacteria anywhere in the body.

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In summary, the postmortem showed acute intestinal obstruction caused by volvulus brought about by old adhesions between the ileum and the abdominal wall at the site of the old appendectomy wound.

DR. LINTON: It seems to me that too many cases of this nature are occurring. We have had a number, and I have seen one very recently. It is a condition that can be prevented, and it merely means a careful toilet when a surgeon is closing the peritoneum. In an adult, there is practically always sufficient omentum to interpose between the loops of the small bowel and abdominal wound. In a child, the omentum is not so large, and one cannot always do it so readily. For that reason, one should take more care and be sure that the wound presents an absolutely smooth surface from within the peritoneal cavity, so that the small bowel cannot become adherent to it. We have had within a year a patient very similar to this in whom the loop of ileum had become adherent to the stump of the appendix, which had not been infolded or invaginated into the cecal wall. That patient, even though he did not die so quickly as this one, did succumb while in the hospital and while an effort was being made to prepare him for operation. He drained an unusual amount of fluid from the Miller–Abbott tube, and it was never possible to hydrate him. It seems too bad that patients should lose their lives from something that can be prevented very easily if a careful surgical technic is used.

DR. HAROLD L. HIGGINS: It impresses me that these cases often carry on with minimal symptoms for two or three days after the initial vomiting. This child apparently was not sick enough for the attending physician to spot the fact that it was a case of intestinal obstruction. In one case that I saw recently, the doctor who cared for it got the impression it was merely so-called "intestinal flu."

DR. TRACY B. MALLORY: You were inclined, Dr. Farber, to assume that the obstruction at the start was intermittent and became permanent only shortly before exitus?

DR. FARBER: Yes.

CASE 27322

PRESENTATION OF CASE

First Admission. A forty-eight-year-old housewife entered the hospital complaining of frequent colds, sinusitis, easy fatigability and a chronic cough with small amounts of green sputum. She had also noticed a gain in weight.

Physical examination showed infected tonsils; the blood pressure was 125 systolic, 80 diastolic. A tonsillectomy was performed, and the patient discharged one week later.

Second Admission (ten months later). The patient was admitted primarily for back strain following a fall a few days previously. In addition to chronic sinusitis, which still troubled her, she complained of occasional nausea and vomiting in the morning during spells of coughing and, in addition, a feeling of lethargy, sleepiness and anorexia.

In the previous five years, her periods had become irregular and scanty, and these symptoms were accompanied by hot flashes and an increasing nervousness. There had been a weight gain of 25 pounds in the previous two years, although presumably she had followed a 1200-calorie diet. For twenty-three years, the patient had been in the habit of drinking at least two cocktails before dinner each night. At no time had jaundice or tarry stools been noticed.

On examination, the patient was moderately obese and in no distress. The heart was normal, and fine rales were heard at the lung bases; the blood pressure was 150 systolic, 110 diastolic, the pulse 90 to 100. The liver was palpable four fingerbreadths below the costal margin, and a little tenderness was elicited on deep palpation. Slight tenderness was present over the lumbar spine and sacrum.

The urine showed a + test for albumin. The blood showed a red-cell count of 4,120,000 with a hemoglobin of 14.8 gm. (photoelectric-cell technic), and a white-cell count of 7100 with 52 per cent polymorphonuclears, 29 per cent lymphocytes and 19 per cent mononuclears. The sedimentation rate was 50 mm. in one hour; the nonprotein nitrogen was 17 mg. per 100 cc., the protein 7.0 gm., and the serum van den Bergh 2.2 mg., biphasic. A follicle-stimulating-hormone test was positive; the basal metabolic rate was +35 per cent; and a blood Hinton reaction was negative.

The patient was on a low-calorie diet, and two days after admission acetone was noticed on her breath. The urine then showed a +++ test for acetone and + test for bile; the blood sugar was 88 mg. per 100 cc. The diet was readjusted, and two days later both the acetone and bile had disappeared from the urine.

The patient was discharged on the fifth hospital day, with diagnoses of obesity, menopause, chronic bronchitis and sinusitis. Treatment consisted of a low-calorie, high-vitamin diet and endocrine preparations.

Final Admission (fifteen months later). In the interval between admissions, the patient had suffered from essentially the same symptoms as be-

fore — nervousness, lethargy and occasional nausea and vomiting. She was somewhat apprehensive, and her pulse ran between 110 and 120.

One week before admission, the patient suddenly developed a digestive upset, with malaise, nausea and vomiting, diarrhea and, finally, prostration. Her physician noticed that she was jaundiced and advised hospitalization.

The family and past histories were irrelevant.

On examination, the patient was listless and apathetic, but rational. Her skin was dry, hot, dehydrated and markedly jaundiced, with a mild telangiectasia of the hands and face. The heart was normal; moist rales were heard throughout the dependent parts of the left lung; the blood pressure was 90 systolic, 60 diastolic. The abdomen was distended, tense and tympanitic, with shifting dullness but normal peristalsis. Liver dullness reached the fifth interspace, and the organ could be felt on a level with the iliac crest in the mid-clavicular line.

The temperature was 97°F., the pulse 110, and the respirations 22.

The urine showed a ++ test for albumin, with a yellow sugar reaction and a ++ test for bile. The bile-stained sediment contained many hyaline and finely granular casts, a rare cellular cast and 50 white blood cells per high-power field. The blood showed a red-cell count of 1,590,000 with a hemoglobin of 65 per cent, and a white-cell count of 18,400 with 76 per cent polymorphonuclears. The nonprotein nitrogen of the blood serum was 15 mg. per 100 cc., the icteric index 50, a van den Bergh 10.9 mg. per 100 cc.; a bromsulfalein test showed 100 per cent retention of the dye in the serum. The total serum protein was 6.9 gm. per 100 cc., the albumin being 3.5 gm., and the globulin 3.4 gm.

The patient was given a high-carbohydrate, high-vitamin, low-fat diet, with calcium gluconate by mouth and 25 per cent glucose solution intravenously. The course was rapidly downhill, and on the third hospital day the temperature was 104°F., the pulse 130, the respirations 40, and the blood pressure 128 systolic, 66 diastolic. The patient lapsed into coma, cyanosis appeared, and the jaundice intensified, although it was never extreme. Death occurred on the seventh hospital day.

Differential Diagnosis

Dr. Charles L. Short: I think we can dismiss the first admission, which occurred two years before death, as irrelevant. At least, I can find no clue there of the ultimate cause of death, although of course it is possible that the fatigue may have been an early symptom of some underlying serious chronic disease.

At the second admission, fifteen months before death, the patient still had the nonspecific complaints of fatigue, nervousness and lethargy, some of which may be assigned to the oncoming menopause. In addition, she had anorexia and vomiting, which point to trouble in the digestive tract. The important diagnostic features at this admission seem to be the large and tender liver, the increased sedimentation rate and the subclinical jaundice, as shown by the van den Bergh test. I should think that the diagnosis of liver disease might at least have been entertained at this time, although there is no mention of it among her discharge diagnoses. I do not believe that we can overlook the increased basal metabolism although only one determination was done. I shall refer to that later.

In the hospital, she developed ketosis from a low-calorie diet. This seems an unusual development and perhaps points to a deficiency of glycogen storage in the liver. Furthermore, if liver disease was already present, this episode certainly was of no benefit to this organ.

On the third admission, the patient obviously had severe liver disease. Again there was an episode of starvation preceding the exacerbation of symptoms, which must have contributed further injury to an already damaged liver. She apparently had a severe anemia. Although the red-cell count was extremely low, the hemoglobin was 65 per cent, thus giving the amazing color index of 2. In the record, there is no description of the smear. At any rate, it seems to have been a hyperchromic anemia, which would go with liver disease.

Dr. Tracy B. Mallory: One smear is recorded: "Some of the red cells appear well filled with hemoglobin; others show considerable variation in size. Many red cells appear larger than normal, and rare stippled cells are present. There are 1 per cent young polymorphonuclears; otherwise the white cells are normal. The platelets are increased."

Dr. Short: The patient had laboratory evidence at this final admission of severely upset liver function, with an altered albumin-globulin ratio. In spite of treatment, she died in about a week.

I think she obviously had primary or secondary liver disease. With the ascites and the rather rapid final decline, we can probably eliminate biliary obstruction, owing to gallstones or to neoplasm, as a cause of the liver damage. The increased metabolism and the rapid pulse suggest

hyperthyroidism. Decreased liver function has been described secondary to Graves's disease, but it would hardly be as severe as this, and there were no other diagnostic features of hyperthyroidism. There are two other conditions with increased metabolism in which the liver might be involved. These are malignant lymphoma and leukemia. There is no other evidence that I can see for lymphoma, and a leukemia at this stage would probably show some evidence of its presence in the peripheral blood. No bone-marrow studies, of course, were done. A monocytic leukemia might have produced this terminal picture, but I think we shall have to let the increased metabolism go as a single finding that was not confirmed. There is no positive evidence of primary or secondary neoplasia of the liver, although we cannot entirely rule it out.

We are left, then, with some type of hepatitis or cirrhosis. We have already decided against biliary cirrhosis. The facts that the patient was a woman and that there was a lack of pigmentation are against hemochromatosis. However, she did have glycosuria on the third admission, although this may have been due to therapy with intravenous glucose solution. One of the interesting features of this case is the size of the liver, although we know that the clinical estimate of the size of the liver is notoriously inaccurate. If the examiner was able to palpate the liver edge through a fatty abdominal wall and through the ascites, it certainly was a very large liver, with the edge down to the iliac crest. I think that this fact alone is against a toxic cirrhosis, with or without a final episode of acute liver-cell destruction. We ordinarily think of the liver in alcoholic cirrhosis as reduced in size, but this certainly is not always true. I do not believe that a liver even this large is against the diagnosis. This is especially true if the cirrhosis is in the stage, as I believe it may have been, of fatty infiltration, as described by Connor and Chaikoff,[1] rather than being markedly fibrotic. The patient had a history of a consistent intake of alcohol over many years, had been on a restricted diet, and at times had actually been starved. I shall make a final diagnosis, then, of alcoholic cirrhosis, probably in a stage in which fatty infiltration predominated.

Dr. Wyman Richardson: I shall say cancer, if we accept the size of the liver as it is given here. A liver as big as this is prima-facie evidence of some form of neoplasm.

I think Dr. Short ought to know whether there was any bile in the stool. Do you know that?

Dr. Mallory: I cannot find a stool report.

Clinical Diagnoses

Cirrhosis of liver?
Ascites.

Dr. Short's Diagnosis

Alcoholic cirrhosis of liver, in stage of fatty infiltration.

Anatomical Diagnoses

Acute alcoholic cirrhosis.
Ascites.
Dermoid cyst of left ovary.
Obesity, slight.

Pathological Discussion

Dr. Mallory: This is a very alarming story, if one believes it literally, because the patient died of acute alcoholic cirrhosis beyond any shadow of doubt. The liver weighed 4000 gm. — even 5000 gm. is possible in such cases. It was bright yellow, owing chiefly to extensive fat deposit but also to some degree of intrahepatic bile stasis, and very finely granular but quite tough on section — a definite cirrhosis was already present. The liver cells showed the typical so-called "alcoholic hyalin" that one expects in such a case.

If one believes that two cocktails daily for twenty years were really responsible, I think we should all be greatly alarmed. However, we have some evidence, at any rate, that her statements were not entirely reliable. For instance, she swore that she adhered to a 1200-calorie diet, yet she gained over 30 pounds in a year. So that she may have cheated on the alcohol as she did on the food. We did make a few more inquiries afterward, and the results were suspicious although not actually positive: we discovered that gin was bought by the case, and we finally got an admission of at least a case a month. I am still not sure that is the whole story.

The cirrhosis had not advanced to a stage that produced any marked degree of portal congestion. The spleen weighed only 200 gm., scarcely enlarged at all. The amount of ascitic fluid was rather small — only a liter; it was probably due more to the change in level of the serum proteins, that is, the shift in the albumin-globulin ratio, than to the degree of portal congestion.

Dr. Short: This is probably the first stage of portal cirrhosis?

Dr. Mallory: Yes. One not infrequently observes deaths in an even earlier stage. In large city hospitals and at the medical examiners' table, cases are frequently seen of deaths from acute hepatic insufficiency, showing large fatty

livers with no trace of cirrhosis. Such cases usually have stories not merely of extensive consumption of alcohol but also of virtual starvation so far as food intake is concerned. There is an interesting article by LeCount and Singer[2]—Dr. LeCount was medical examiner for Cook County for many years—on acute hepatic insufficiency as a cause of sudden death. They raised the question whether these deaths might be hypoglycemic, but had no direct proof of it. The livers were virtually devoid of glycogen at autopsy.

A PHYSICIAN: Was there any evidence of gastric hemorrhage?

DR. MALLORY: There was no history of gastric hemorrhage, so far as we know. There were no demonstrable varices. There was a dermoid cyst of the ovary, which had never been discovered.

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"SALE OF ALCOHOL IN MASSACHUSETTS"

Mr. Samuel Silverman's letter, appearing elsewhere in this issue of the *Journal*, criticizes a recent editorial; several of his objections and complaints seem to call for additional editorial comment.

The implication that Mr. Silverman and his friends are better psychologists than Dr. Moore and his associates is a matter of opinion and needs no discussion.

Mr. Silverman claims that alcoholism is an unfair term to apply to those who use alcohol for beverage purposes and who suffer and die therefrom. It has been proved so many times that ethyl alcohol is the toxic agent in alcoholic beverages which produce intoxication, sometimes with a fatal termination, that this question needs no discussion.

The letter asserts that the statistics and data contained in the former editorial are inaccurate and unfair. The statistics were obtained by Assistant Surgeon General Lawrence Kolb, of the United States Public Health Service, and are obviously authentic. The data with reference to arrests for alcoholism were furnished by the police departments of the respective cities shown, and the death rates by the health departments of the respective cities. Mr. Silverman's quarrel appears to be with a governmental agency and with the police and health departments of Baltimore, Boston, New York, Philadelphia and Washington.

It is said that the data used by Drs. Alexander, Moore and Leary, referring to deaths certified by medical examiners in Massachusetts as directly related to the ingestion of ethyl alcohol, are unwarranted. This attitude undoubtedly arises from the fact that Mr. Silverman, as mentioned above, does not recognize that alcohol, whether imbibed as whisky or as ethyl alcohol, is the toxic cause, directly or indirectly, of the deaths recorded. The proponents of the bill under discussion made no claim that 95 per cent alcohol, as sold by druggists, was the exclusive cause of these deaths.

Mr. Silverman warns that restriction against the sale of 95 per cent alcohol by retail druggists would result in the return of the bootlegger and so forth. This acknowledges that the 95 per cent alcohol sold by druggists is used for beverage purposes. The intent of the law was that its use was to be limited to mechanical, chemical or medicinal purposes only; it was not to be used as a beverage.

To understand the situation which obtains with reference to the sale of 95 per cent alcohol by the druggist, a review of recent history is necessary. Before Prohibition, 95 per cent alcohol was used for alcohol baths, the sterilization of thermometers and other such purposes; it was not used as a beverage. Following the Prohibition Amendment, as bootlegging became organized, the smuggling of 95 per cent alcohol was found to be just as easy as that of beer and wine, and much more profitable. The American public developed

a taste for hard liquor, and 95 per cent alcohol became popular as a beverage for the first time. Because of this, bathing alcohol and other forms of denatured alcohol were evolved for home use. As a beverage, 95 per cent alcohol was more hazardous than other alcoholic beverages because of its concentration; as its users became intoxicated they tended to be less careful about its dilution, and the death rate was high. With the repeal of Prohibition, the death rate increased to a still higher level, and there is ample police evidence to the effect that 95 per cent alcohol was, and still is, the responsible agent in a large percentage of cases.

Under the practice before Prohibition, the druggist who obtained a certificate of fitness from the Board of Registration in Pharmacy, for which he paid $1.00 annually, was authorized to sell intoxicating liquors on the prescription of a physician, and could sell pure alcohol for mechanical, chemical and medicinal uses. The cost of a certificate of fitness has since been increased to $5.00. With the revision of the laws following the repeal of Prohibition, the requirement that alcohol be sold for mechanical, chemical or medicinal purposes was withdrawn, although it is still sold by druggists with a label indicating this restriction on its uses. Basically, however, the druggist under present-day law is allowed to sell 95 per cent alcohol as a beverage at a cost of $5.00 per annum for a certificate of fitness. This is special privilege indeed!

The danger of the return of the bootlegger if the privilege of the druggist were restricted is not serious. Massachusetts is the only state permitting the free sale of 95 per cent alcohol by druggists, and yet other states have not unduly suffered from bootleggers.

Finally, it is claimed that physicians would suffer if they were required to write prescriptions for 95 per cent alcohol. In the other forty-seven states there has been no objection on the part of the medical profession to this requirement. In New York, for example, physicians have not complained, and the death rate from alcoholism has been lowered in New York City since the repeal of Prohibition, in contrast with the increased rate in Massachusetts, notably, in Boston.

If it is granted that the unrestricted sale of 95 per cent alcohol by retail druggists is a privilege, an assumption that the activities and letter of Mr. Silverman seem to bear out, it is difficult to rationalize how the unselfish efforts of physicians such as Dr. Leary and Dr. Moore to abolish, or at least to ameliorate, an indubitable public-health hazard should have received so little support from the legislators of Massachusetts.

LOCAL HEALTH DEPARTMENTS

It is beginning to be apparent that local health departments, like most other divisions of human activity, cannot long stand still. Many formerly adequate health departments that tried to drift along have found themselves overtaken during the past decade: for example, one in the vicinity of Boston is now being administered by the head of the welfare department, for better or for worse. The fact that such officials have had no public-health or even scientific training does not disconcert them in the least — they can more glibly recite the incubation periods of communicable diseases than most physicians can. There has often been a gradual shift from physicians who may or may not have been good administrators to administrators who may or may not have been good physicians, and now are finding out that they need not have been physicians at all — just administrators.

The question of how much public-health authority can be safely taken over on a pure administrative basis could be debated at some length: professional and technical assistance is always available; sanitary ordinances are well codified; and the simpler types of milk-route epidemiology are now popularly understood. The public-health worker who rests entirely on these will soon find that he is in nonprofessional competition. A wholesome reaction to this static influence has been the production of well-conceived and well-written reports. A recent excellent example is the *Annual Report* of the Public Health Depart-

ment of the City of Newton, Massachusetts. Although it is always easy to say that a city that can spend $75,000 annually on its public-health department can afford to do such a thing, it is not necessarily a matter of having the funds to pay a printer's bill, as one can demonstrate by reading the mimeographed material pertaining to public health that is issued periodically by the Town of Belmont, Massachusetts. Here the same purpose is well served in a very economical manner. Something more than administrative ability is responsible for these reports.

The Newton report for 1940 is altogether admirable. It contains many items of interest to the citizens, in addition to the usual statistical information. There is, for example, a tribute to the late Dr. Edward Mellus, who was a member of the department at the time of his death. There are accounts of the Newton Community Council, the Newton Hospital, the Newton Medical Club, the Newton Dental Society, the Newton District Nursing Association, the Boy Scouts, the Girl Scouts, the Red Cross and other such organizations. All these things tend to knit together the interests of a community and to hasten the day when fewer surveys and more frequent coordinated activities on the part of groups of participating agencies will appear. Public-health activities need not be streamlined, but there are many cities and towns in which there are both omissions and duplications of effort. The degree in which public-health officials are aware of these omissions and duplications determines the proportion in which they are increasing the value of the services they render to the people.

MEDICAL EPONYM

Von Jaksch's Anemia

This clinical entity was described by Professor Rudolf von Jaksch (1855–), of Graz, in a paper, "Ueber Leukamie und Leukocytose im Kindesalter [Leukemia and Leukocytosis in Childhood]," which appeared in the *Wiener klinische Wochenschrift* (2: 435–437, 457, 1889). A portion of the translation follows:

> There is still another form of anemia found in childhood, the symptoms and clinical course of which resemble the picture of leukemia: there is marked swelling of the spleen, liver and lymph nodes, persistent and marked leukocytosis (the proportion of white to red cells may be 1:20, 1:17 or 1:12), but in spite of this, autopsy reveals no leukemia.
>
> To differentiate it from leukemia and in the absence of more exact knowledge concerning the condition, I prefer to term it *anaemia infantum pseudoleucaemica* after its most prominent symptoms. . . .
>
> There is a certain noticeable lack of accord between the size of the liver and that of the spleen, in that the liver increases in volume relatively less than the spleen; moreover, the liver is not felt as a swollen tumor with a thick rounded outline as it is in leukemia, but in spite of the increase in volume the sharp lower edge can be definitely palpated. . . .
>
> The prognosis is not entirely unfavorable. At least I have seen one patient with an undoubted case of this disease recover.

R. W. B.

MASSACHUSETTS MEDICAL SOCIETY

SECTION OF OBSTETRICS AND GYNECOLOGY*

Fatal Urinary Suppression Following Cesarean Section and Transfusion

A thirty-five-year-old para IV was delivered by cesarean section a week after the expected date of confinement. She had had three previous cesarean sections because of a contracted pelvis.

The prenatal care was adequate. The pregnancy had been complicated by bleeding, which began at approximately six months, and the patient was kept in bed for six weeks. There was no real hemorrhage, but staining occurred whenever she got out of bed.

Labor started, and the patient began to bleed. A cesarean section was performed, and an unusual amount of bleeding occurred at the time of operation. The placenta came away with much difficulty; the record states that it had to be dug out in pieces.

Eighteen hours after delivery, the patient's condition was not good. She was grouped for transfusion, and 500 cc. of citrated blood obtained from the husband was given. Thirty-six hours after the transfusion, the kidneys ceased to function properly, and only 30 cc. of urine was obtained in the thirty-six hours preceding death. The patient died three days after operation.

Comment. This death occurred before bloods were matched and cross-matched as they are today, and illustrates the importance of selecting a

*A series of selected case histories by members of the section will be published weekly. Comments and questions by subscribers are solicited and will be discussed by members of the section. Letters should be addressed to Dr. Raymond S. Titus, *Secretary*, 330 Dartmouth Street, Boston.

proper donor. Undoubtedly the blood was incompatible.

Acute urinary suppression following the transfusion of an incompatible blood is a serious complication; it often results in death, but is sometimes amenable to surgery by decapsulation of the kidney.

It was unwise to allow this patient to go to term and start in labor when she had been bleeding off and on for three months. A much wiser policy would have been to deliver her by cesarean section at eight and a half months, when one would have been well assured of a viable child. There is no specific mention that the placenta was abnormally situated, but it is quite likely that there was some type of placenta previa.

RESOLUTIONS ON THE DEATH OF CHARLES LEO McCROSSAN

WHEREAS, The sudden and untimely death of Charles Leo McCrossan, long a resident and physician of Somerville, has brought sadness to the people of the city; and

WHEREAS, His passing has deprived our profession of a noted benefactor and leader whose skill has brought distinction to his profession and whose achievements merit the esteem and admiration of all who knew him; and

WHEREAS, His sacrifices in his generous acts of administering to the comfort of our sick and distressed will never be forgotten by those who knew him; be it therefore

RESOLVED, That we, the members of the regular staff of Central Hospital, assembled in session, hereby express our profound sympathy to his sorrowing wife and family in this, their hour of loss; and be it further

RESOLVED, That a copy of this resolution be forwarded to the members of the family, and also placed in the archives of Central Hospital and forwarded to the *New England Journal of Medicine*.

HARRY H. GERMAIN, M.D.
BARNETT C. TITELBAUM, M.D.
MICHAEL W. WHITE, M.D.

DEATHS

BAKER — NORMAN C. BAKER, M.D., of Lexington, died July 31. He was in his fifty-ninth year.

Dr. Baker received his degree from the Jefferson Medical College of Philadelphia in 1908, and at the time of his death was administrative assistant to Dr. Nathaniel Faxon, director of the Massachusetts General Hospital.

He was a fellow of the Massachusetts Medical Society and the American Medical Association.

His widow and son survive him.

BLAKE — GERALD BLAKE, M.D., of Brookline, died July 28. He was in his sixty-second year.

Born in Boston, he attended the Volkmann School and Harvard College, and received his degree from Harvard Medical School in 1905. He was for many years physician at the Massachusetts General Hospital and consulting physician at the Massachusetts Charitable Eye and Ear Infirmary, and at one time was a member of the Executive Committee of the Boston Medical Library.

He was a fellow of the Massachusetts Medical Society and the American Medical Association.

His widow, a son and a daughter survive him.

DAVIS — MINOT F. DAVIS, M.D., of Cambridge, died July 26. He was in his eightieth year.

Born at Carlisle, he attended McCollum Institute, Mt. Vernon, New Hampshire, and received his degree from the University of the South, Medical Department, in 1901.

He was on the staffs of the Boston City Hospital and the Massachusetts Eye and Ear Infirmary before he retired from active practice. Dr. Davis was a member of the Massachusetts Medical Society and the American Medical Association.

A nephew survives him.

HURWITZ — ABRAHAM J. HURWITZ, M.D., of Brookline, died July 30. He was in his sixty-seventh year.

Born in Russia, he graduated from the Massachusetts College of Pharmacy and received his degree from Tufts College Medical School in 1902. From 1900 to 1901 he was laboratory assistant in medical chemistry and toxicology at Tufts College Medical School. He was on the staffs of the Beth Israel Hospital and the Boston Dispensary.

Dr. Hurwitz was founder and first president of the Greater Boston Medical Society, and was a member of the Massachusetts Medical Society and the American Medical Association.

His widow, two daughters, three brothers and a sister survive him.

RECORD — MYLES S. RECORD, M.D., of Abington, died July 25. He was in his forty-second year.

He received his degree from Tufts College Medical School in 1925, and was a former member of the Massachusetts Medical Society and the American Medical Association.

TULLY — GEORGE W. TULLY, M.D., of Southbridge, died July 21. He was in his fifty-fourth year.

Dr. Tully received his degree from Tufts College Medical School in 1912. He interned at St. Vincent Hospital, Worcester, and at the time of his death was senior physician at the Harrington Memorial Hospital, Southbridge.

He was a member of the Massachusetts Medical Society and the American Medical Association.

His widow, three daughters, a son, a brother and a sister survive him.

YOUNG — ROY D. YOUNG, M.D., of Arlington, died July 25. He was in his seventy-first year.

Born in Evans Mills, New York, he attended the University of Michigan and received his degree from Columbia University College of Physicians and Surgeons in 1898.

From 1910 to 1925, he was head of Dr. Young's Hospital, which was the only hospital in Arlington at the time he opened it. He was a member of the Massachusetts Medical Society and the American Medical Association.

A son, Dr. Kenneth T. Young, a daughter and four grandchildren survive him.

MISCELLANY

PNEUMOTHORAX IN PATIENTS OVER FORTY

Of what value is pneumothorax in patients of middle age? Numerous studies of the results and complications attending artificial pneumothorax have been made, but these have nearly all been concerned with patients between the ages of fifteen and thirty-five. Our actual knowledge of the precise merits of pneumothorax in patients over forty is still meager. For that reason, a study (Diamond, S., and Ivey, H. T. Artificial pneumothorax in patients over forty. *Am. Rev. Tuberc.* **43**:475–490, 1941) made of World War veterans in whom pneumothorax was instituted merits attention. An abstract of their article follows:

A survey was made of 431 white World War veterans in whom pneumothorax was instituted or attempted after they had passed their fortieth birthday, during a five-year period beginning January 1, 1935. Every one of the patients had a positive sputum and a roentgenographically demonstrable cavity at the inauguration of his collapse program. Eighty-one per cent had far advanced disease; 19 per cent had moderately advanced lesions. The disease process was unilateral in 49.3 and bilateral in 50.7 per cent. Fourteen per cent had at least one cavity whose diameter exceeded 4 cm. The average age was slightly under forty-four years — 7 per cent were over fifty. The duration of the patients' tuberculosis prior to the attempted induction ot pneumothorax ranged from one month to eighteen years.

Patients with apparently permanent closure of the cavities and conversion of the sputums were classed as "successful," and these numbered 92, or 20.2 per cent. The "unsuccessful" numbered 48.7, and the "impossible" 31.1 per cent. The various complications of artificial pneumothorax occurred with no greater frequency than among younger patients. Death was due directly to the complications of pneumothorax in 5 patients. Sixteen of the patients who died had pure tuberculous empyemas, although it is difficult to estimate the degree in which the presence of intrapleural pus contributed to these deaths, for in all cases the pulmonary lesion was actively progressive. Including these 16 cases, the fatalities consequent to complications numbered only 21, or 4.9 per cent, of the patients treated, which is about what may be expected in general.

The shorter the time the patient has been ill and the less extensive his lesion, the greater the chances for the success of the therapy and the smaller the probability of occurrence of empyema. Closure of the cavity is effected earlier in patients whose disease history has been brief, although pleural effusions — a complication of little significance in most cases — are likelier to supervene in persons who have had tuberculosis only a short time.

The time interval of cavity closure and sputum conversion varies directly with the patient's age; most of the pneumothoraxes became successful in the latter half of their first year. It seems advisable, therefore, to maintain pneumothoraxes of doubtful efficacy for a longer time in persons over forty than would be wise in younger patients.

Bilateral pneumothorax, properly administered in carefully selected cases, is well tolerated and ordinarily occasions no marked respiratory embarrassment. The surgical division of pleural adhesions is necessary to the completion of the collapse in a large number of persons in the fifth decade, just as it is in younger patients.

Weighing the results and the complications, the authors conclude that artificial pneumothorax is of distinct value in the treatment of patients over forty. It is not so effective as in younger persons, but neither is any other therapeutic measure. Thus far it appears that artificial pneumothorax is enduring in its effects in persons over forty, but final conclusions cannot be drawn until most or all patients in the successful group have been observed for a sufficient length of time after reexpansion to permit accurate estimation of the lasting effectiveness of their pneumothorax. — Reprinted from *Tuberculosis Abstracts*, July, 1941.

RÉSUMÉ OF COMMUNICABLE DISEASES IN MASSACHUSETTS FOR JUNE, 1941

Diseases	June 1941	June 1940	Five-year Average*
Anterior poliomyelitis	1	2	4
Chicken pox	1170	851	1079
Diphtheria	11	6	10
Dog bite	1302	1249	1383
Dysentery, bacillary	14	11	12
German measles	535	64	211
Gonorrhea	302	292	384
Lobar pneumonia	207	225	268
Measles	3925	5222	3556
Meningococcus meningitis	16	1	8
Mumps	1114	641	743
Paratyphoid B fever	5	6	13
Scarlet fever	639	379	685
Syphilis	391	339	430
Tuberculosis, pulmonary	297	229	291
Tuberculosis, other forms	23	24	38
Typhoid fever	7	7	7
Undulant fever	7	3	3
Whooping cough	978	579	599

*Based on figures for preceding five years.

Geographical Distribution of Certain Diseases

Anterior poliomyelitis was reported from: West Springfield, 1; total, 1.

Anthrax was reported from: Peabody, 1; West Boylston, 1; total, 2.

Diphtheria was reported from: Boston, 5; Fall River, 5; Framingham, 1; total, 11.

Dysentery, amebic, was reported from: Boston, 1; total, 1.

Dysentery, bacillary, was reported from: Lynn, 12; Peabody, 1; Russell, 1; total, 14.

Infectious encephalitis was reported from: Middleboro, 1; Watertown, 1; total, 2.

Malaria was reported from: Haverhill, 1; total, 1.

Meningococcal meningitis was reported from: Boston, 1; Braintree, 1; Brockton, 1; Camp Edwards, 7; Fitchburg, 1; Northbridge, 1; Reading, 2; Weymouth, 1; Worcester, 1; total, 16.

Paratyphoid B fever was reported from: Adams, 1; Beverly, 1; Lexington, 1; Salem, 1; Worcester, 1; total, 5.

Pellagra was reported from: Boston, 1; total, 1.

Pfeiffer bacillus meningitis was reported from: Lancaster, 1; total, 1.

Septic sore throat was reported from: Beverly, 3; Bos-

ton, 6; Brockton, 1; Cambridge, 1; Fall River, 3; Fort Strong, 1; Newton, 1; total, 16.

Tetanus was reported from: Attleboro, 1; Hingham, 1; Methuen, 1; Quincy, 1; Worcester, 1; total, 5.

Trachoma was reported from: Boston, 1; total, 1.

Trichinosis was reported from: Camp Edwards, 11; total, 11.

Typhoid fever was reported from: Beverly, 1; Boston, 2; Fall River, 1; Haverhill, 2; Springfield, 1; total, 7.

Undulant fever was reported from: Arlington, 1; Lowell, 1; Norfolk, 1; Plymouth, 1; Shelburne, 1; Stockbridge, 1; West Brookfield, 1; total, 7.

Meningococcus meningitis was more prevalent than in any month since May, 1937.

Mumps showed a higher incidence than that in any June since 1936.

The incidence of undulant fever, although lower than that of the two previous months, is the highest for June since reporting began.

Chicken pox, German measles, measles and whooping cough were reported above the five-year averages.

Diphtheria, bacillary dysentery, pulmonary tuberculosis and typhoid fever were at normal levels.

Dog bite, gonorrhea, lobar pneumonia, paratyphoid B fever, scarlet fever and syphilis were reported below the five-year averages.

Only one case of anterior poliomyelitis was recorded during the month.

CORRESPONDENCE

"SALE OF ALCOHOL IN MASSACHUSETTS"

To the Editor: I am the "paid druggists' lobbyist" mentioned in the editorial appearing in the May 1 issue of the *Journal*, under the caption "Sale of Alcohol in Massachusetts," and I take no offense because of this title since Dr. Merrill Moore and others who were interested in securing the passage of the alcohol prohibition act also employed a lobbyist, but whether he was paid I do not know.

I believe your profession, which your journal reaches, ought to know all the facts pertaining to the attempt on the part of certain physicians to secure the repeal of the present law which permits retail druggists to sell alcohol for medicinal purposes. In the first place, may I state that from my conversations with many physicians I am satisfied that they do not agree with Dr. Moore and the others? Indeed, many psychiatrists are opposed to the position taken by Dr. Moore and the others with reference to the sale of alcohol by retail druggists. I know that Dr. Moore and other psychiatrists are tackling the problem of preventing death from alcoholism from the wrong end.

Psychiatrists are in agreement, I believe, that the question of alcoholism and its effect upon the individual is a personal problem and cannot be solved by a general attack. I am not a psychiatrist or even a physician, but I do believe that the question of treating those who suffer from alcoholism must be individual and not treated as a mass problem. However this may be, I do not believe that the statistics and data contained in the editorial and which were in the main submitted to the Massachusetts Legislature are accurate or even fair. In any event, the Committee on Legal Affairs of the Massachusetts Legislature and the Massachusetts Senate and House of Representatives did not agree with the statistics submitted, as both branches voted against a change in the present law.

I know that doctors will agree with me that "alcoholism" is an unfair term to apply solely to those who use alcohol for beverage purposes. Dr. Moore has very loosely used the statistics relating to alcoholism to apply to alcohol as such. His statistics as to the number of arrests and the number of deaths from alcoholism cannot by any stretch of the imagination be confined solely to alcohol, but undoubtedly refer to alcoholic beverages, which include whisky and other alcoholic beverages. To prevent a greater mortality or insanity from alcoholism, Dr. Moore should come out openly as a prohibitionist to prevent the sale, so far as possible, of all alcoholic beverages or else agree to confine the attack to the individual who suffers from alcoholism. The loose use of the word "alcoholism" by Dr. Moore and others to prevent the sale of alcohol by retail druggists was easily apparent to the members of the Legislature.

The statement accredited to Drs. Alexander, Moore and Leary "that 4505 deaths certified by medical examiners in Massachusetts from 1928 to 1938 were directly related to the ingestion of ethyl alcohol" is absolutely unwarranted and unfair because no one of these doctors has been able to certify that these deaths were directly related to the ingestion of ethyl alcohol as differentiated from other alcoholic beverages. In fact, before the legislative committee there was no defense made by Dr. Moore and the others to the proposition advanced that those patients who were charged with suffering from alcoholism were those who had taken alcohol as well as other alcoholic beverages, and that it was impossible to determine just what alcoholic beverage caused the death of the individual. The comparative statistics in the editorial indicating the number of arrests for intoxication in the various large cities of the United States are indeed misleading and unfair, because the number of arrests for intoxication always depends upon the policy of the police with reference to arrests. For example, in a city like New York very few arrests are made for intoxication because the policy of the police is not to bother with intoxicated persons other than to see to it that they are not harmed, while in other cities, like Boston, such persons are readily arrested. It is obvious that this factor must be considered in determining the number of inebriates, for no rational person will believe that in a given year, New York with a population of 7,000,000 people had only 112 arrests for intoxication, while a city like Boston with a population of approximately 790,000 had 5171 arrests for intoxication. The statistics are so absurd that any intelligent person can appreciate that important factors are missing.

Aside from all this, there is another important phase of the problem which Dr. Moore and his colleagues avoid. They do not answer the proposition that in Massachusetts the restriction against the sale of alcohol by retail druggists would inevitably result in the return of the bootlegger and the use of poisonous alcohol by those alcohol addicts who will be bound to secure their alcohol. So too, will it mean the return of witch hazel, Jamaica ginger, wood alcohol and other types of alcohol drinking, for if the retail druggist is denied the right to sell alcohol, the alcohol addict whom Dr. Moore talks about will resort to every means to secure his alcohol since there will be no avenue available to him because package stores do not sell alcohol. In other words, Dr. Moore would make the cure worse than the disease for the alcohol addict, while at the same time denying to honorable people the right to secure alcohol for medicinal purposes, of which there are many, unless the purchase were made in at least one gallon quantities.

Many physicians have stated to me that they do not want to be compelled to issue prescriptions for those who need alcohol for medicinal purposes, as it would result in a gratuitous service and a bothersome one. The medical profession is so thoroughly in disagreement on this whole proposition that it seems to me that before any attempt for this legislation is made by certain persons who, for reasons best known to themselves and which perhaps it is not necessary to discuss at this time, a more elaborate, substantial and accurate study should be made of the whole problem of alcoholism.

I have read many of the articles which have been quoted repeatedly by Dr. Moore and Dr. Leary and in most instances these articles refer to alcoholism and the use of intoxicating beverages, and not alcohol as such. We cannot legislate morals into the people. That is an individual problem, and the sooner Dr. Moore and the others approach this whole subject matter from that viewpoint, the sooner will progress be made.

SAMUEL SILVERMAN, *General counsel*
Massachusetts State Pharmaceutical Association

11 Beacon Street
Boston

LICENSE SUSPENDED

To the Editor: The license of Dr. Manford R. Spalding, 129 Central Street, Auburn, Massachusetts, was suspended by the Board of Registration in Medicine on July 11 because of deceit in the writing of narcotic prescriptions.

STEPHEN RUSHMORE, *Secretary*
Board of Registration in Medicine

State House
Boston

BOOK REVIEWS

Medical Genetics and Eugenics. By Charles B. Davenport, A.M., Ph.D.; Clyde E. Keeler, M.A., M.S., Sc.D.; Maude Slye, A.B., Sc.D. (hon.); and Madge Thurlow Macklin, M.D., LL.D. 8°, cloth, 141 pp., with 59 illustrations. Philadelphia: Woman's Medical College of Pennsylvania. $1.00.

The six lectures that comprise this book were delivered at the Woman's Medical College of Pennsylvania. These lectures try to show why a trained physician, as guardian of the public health, should have fuller knowledge of the genetic path by which man, the featherless biped who ordinarily talks, has come to his biochemical constitution.

Dr. Davenport, the distinguished human geneticist, discusses in the first three lectures the subjects, "Human Variability and Mate Selection," "Some Social Applications of Eugenics" and, finally, "Heredity in Relation to Medicine." Dr. Clyde E. Keeler takes up the question, "The Value of Animal Experiments to the Understanding of Human Genetics," in which he emphasizes the point that the identity of a great portion of our germ plasms is the secret of why physiologic experiments may be performed on normal dogs, cats, guinea pigs and rats and the findings of these experiments applied to normal man. Dr. Maude Slye, in a lecture, "Genetics and Cancer," considers her own experimental evidence for the genetic control of the type, the site and the age of cancer. The last lecture, "The Value of Medical Genetics to the Clinician," by Dr. Madge Thurlow Macklin, discusses actual cases that are of particular value to physicians in the diagnosis and therapy of relatively common conditions.

Throughout these lectures runs the plea for teaching more genetics to medical students and for the creation of an enlightened public opinion regarding genetics.

Medicine and Health in New Zealand: A retrospect and a prospect. By Douglas Robb, M.D., Ch.M., F.R.C.S. (Eng.) 8°, cloth, 146 pp. Auckland, New Zealand: Whitcombe and Tombs, Limited, 1940. 8/6.

New Zealand seems to be particularly fitting as an experiment station for a social form of medicine. The experiment is already under way, for over three quarters of the hospital beds of all kinds are provided by the hospital boards of the Public Hospital System under the government. The chief weakness of the scheme at present, according to Dr. Robb, is a lack of cohesion and correlation. There is no central control, which is essential to the orderly development of hospital work. No major changes have been made since 1910, even though the advance of medicine during the last thirty years should have made many changes imperative. This lack of adjustment to modern trends forms the basis of Robb's provocative book. A new survey of the whole situation is needed before any evaluation of the work of the past can be made or plans for the future laid out. This book contains much of interest for American readers, and no one in the field of social medicine should overlook it.

The Medical Reports of John Y. Bassett, M.D. The Alabama student. With an introduction by Daniel C. Elkin, M.D. 12°, cloth, 62 pp., illustrated. Springfield, Illinois: Charles C Thomas, 1940. $1.50.

Dr. John Y. Bassett, the "Alabama Student" of Osler's delightful essay of nearly fifty years ago, whose fine portrait appears as a frontispiece of the published volume, described his experiences as a country doctor in Huntsville, Alabama, in the *Southern Medical Reports* (1849-1851). These volumes are now so rare that they have been reprinted, with an introduction by Professor Elkin. The story of Bassett's work and his letters from Paris, where he studied after his graduation, are too well known by physicians to need repeating. What is new and of great importance in this edition is an appended letter from Mastin to Osler, received after the *Alabama Student* was first published. In this correspondence, Mastin, who entered Bassett's office in Huntsville as a student of medicine, throws new light on Bassett and his career.

The book, a delightful imprint, sets a high standard for American medical publications. It is a choice item not to be missed by any physician or library.

The American College of Physicians: Its first quarter century. By William Gerry Morgan, M.D., LL.D., Sc.D., M.A.C.P. 4°, cloth, 275 pp., with 36 illustrations. Philadelphia: American College of Physicians, 1940. $2.00.

The American College of Physicians was founded in 1915 by Heinrich Stern, of New York, with a few physicians of that city. After Stern's death in 1918, the college fell into some disrepute, but reorganization soon took place on a sounder and more national basis. The headquarters were moved to Chicago. The organization grew rapidly. A journal—*The Annals of Medicine*, later called *The Annals of Clinical Medicine*—was established, but internal dissension was rising and friction again nearly wrecked the project. The college was reorganized for a second time, and headquarters were moved to Philadelphia in 1936. In 1940, there were over

4000 members, and it now contains most of the men recognized in the field of internal medicine.

This book, containing the history of the first twenty-five years of the American College of Physicians, is of considerable value as a record of the development of one of the outstanding medical groups in this country. In addition to the history, there are chapters on the constitution and bylaws, a financial record and a note on the publications by the college. The last part of the book is taken up with a chronology of the twenty-five years. The volume contains many small portraits in the text, but there is no list of members or index. The book is badly printed and is issued in the form commonly used by commercial catalogues. The lack of an index is inexcusable. The American College of Physicians is said to have been based on the Royal College of Physicians in London. Whatever the similarity, it is inconceivable that the older institution would have issued a history of its growth in a format so unfitting as this volume.

Clinical Pellagra. By Seale Harris, M.D., assisted by Seale Harris, Jr., M.D. With a foreword by E. V. McCollum, Ph.D., Sc.D., LL.D. 4°, cloth, 494 pp., with 66 illustrations, and 4 color plates. St. Louis: The C. V. Mosby Company, 1941. $7.00.

This book is extremely valuable as an historical résumé of pellagra. It presents in an interesting and readable manner an account of the research done by workers at home and abroad. It is somewhat of an autobiography of the senior author, depicting his progress in the field of pellagra. His familiarity with the disease is graphically expressed throughout the book. His opinions are very frank and interesting, especially when he discusses the various theories of the etiology of the disease.

Attention is called to the environmental background that makes individuals prone to pellagra. Its relation to other diseases is briefly outlined, the discussions on sprue and pernicious anemia being particularly worth while. The chapter on treatment is excellent, outlining in detail the present-day therapy, with many satirical comments on the indiscriminate use of diets and vitamins. The advice on the patient's dietary regime commands attention. The chapter on prevention is admirable.

The book is of value to Northern physicians, especially in these days when there is a tremendous increase in the use of ethyl alcohol. They should become more conscious of pellagra, for there is no doubt that there are more cases in this climate than one realizes. The book on the whole can be profitably read by all physicians. The only comment that might be made by the reviewer is that there is too much repetition, and that the references, although instructive, could be broadened in their territorial scope.

A Textbook of Clinical Neurology. By J. M. Nielsen, M.D. 4°, cloth, 672 pp., with 179 illustrations. New York: Paul B. Hoeber, Incorporated, 1941. $6.50.

This work is an attempt to present a short, complete review of neurology in one volume — an almost impossible task. The subject, like most specialties, has outgrown a single volume, and neurology has increased in the last twenty years beyond the realm of any individual specialist. No man can keep up with the modern literature; much less can he have the time to evaluate it. Kennier Wilson did so reasonably well up to 1935, but his book grew into two large volumes before his death, and some subjects were incompletely covered. The one-volume, one-man textbook of neurology is probably a thing of the past, and Dr. Nielsen's fine book is an excellent example of the truth of this statement.

The book contains the usual introductory material, with charts similar to those found in many books. The standard diseases are described in the ordinary order, with illustrations of moderate value. What makes the book weak is the lack of evaluation of the literature, and even omissions of certain important additions in the last ten years. The reasons for these shortcomings are clearly stated above: an author cannot be blamed for not completing an impossible job.

For the reviewer, this book will not replace any textbook now at hand. One of the best sections is that on the organic diseases of the brain, which is illustrated by excellent photographs of pathologic sections, particularly gross sections. There is also an excellent chapter on clinical cerebral localization, and another, of less value, on vitamins and avitaminoses. For these sections, the book is of value to the specialist. For students or practitioners, it cannot be particularly recommended.

Born That Way. By Earl R. Carlson, M.D. 12°, cloth, 174 pp. New York: The John Day Company, 1941. $1.75.

This is an unusually interesting biography of a doctor who was born of Swedish parents forty-four years ago. He suffered from a birth injury, which caused cerebral paralysis of the spastic type, with athetosis; awkwardness and stiffness of all four extremities resulted, making life extremely difficult for him from the very start. In spite of his handicap, he went through college and through Yale University School of Medicine, and has made a career for himself by teaching and training children who are similarly affected. He has a school on Long Island and another in Florida.

The book is a well-written story of a dramatic career, and his life illustrates what can be done through persistent effort in overcoming an almost insuperable handicap. It was not easy for him to enter any medical school, and it is greatly to the credit of his medical school that the dean saw in him a man of great promise. The whole world is indebted to him for the splendid example he has set, and for the work that he is doing in helping handicapped children.

Wolf Child and Human Child: Being a narrative interpretation of the life history of Kamala, the wolf girl, based on the diary account of a child who was reared by a wolf and who then lived for nine years in the Orphanage of Nidnapore, in the province of Bengal, India. By Arnold Gesell, M.D. 4°, cloth, 107 pp. New York: Harper and Brothers, Publishers, 1941. $2.00.

This unique account, based on a carefully kept diary of a missionary and his wife, the Reverend J. A. L. Singh and Mrs. Singh, should capture the attention of all readers interested in the age-old problem of Nature versus Nurture. Dr. Arnold Gesell, founder and director of the Yale University Clinic of Child Development, is of the opinion that this story gives ground for new faith in the stamina of human nature and the potentialities of human growth. There are ten instructive illustrations and a good chronology of Kamala's career as a closing chapter of the book. Students interested in the relations between heredity and environment will find it worth while to see that their libraries contain a copy of this book.